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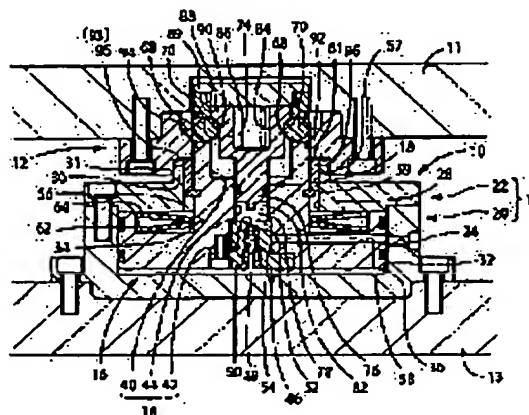
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(54) FASTENER

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a fastener that can improve the accuracy of the fastening position of two members to be fastened together while effectively ensuring a smooth operation of fastening and releasing them.

SOLUTION: For two members 11 and 13 to be fastened, with a second fastening body 12 fitted in a first fastening body 10 including first and second movable members 16, 18 and 70, the first movable member 18 is moved to engage those portions of the second movable members 70 which project from the first fastening body 10 with the second fastening body 12 and to clamp the first and second fastening bodies 10 and 12 together. The first movable member 16 has a projection 57 with an abutting surface 61 opposed to the second fastening body, so that with the first and second fastening bodies 10 and 12 fitted together, the movement of the first movable member 16 presses the abutting surface 61 of the projection 57 against the second fastening body 12 to project the second fastening body 12 in the opposing direction.



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CLAIMS

[Claim(s)]

[Claim 1] it was separately prepared in the opposed face side of two members which should be concluded at location immobilization, respectively -- this, while having mutually the first and second conclusion objects which can fit in in each fitting side which extends in the opposite direction of two members The first migration member made to move the conclusion object of this first in this opposite direction, Are made to move in the right-angled direction to this opposite direction, and while constituting from a conclusion object of this first including the second migration member which projects/moves [level-luffing-motion], said second conclusion object is received. The engagement section which can engage with the second migration member is prepared. the bottom of the projection condition of the second migration member in said first conclusion object -- setting -- this -- this -- the first conclusion object -- this -- under the condition of having made access migration carrying out in said opposite direction, and having made the second conclusion object fitting into it in said fitting side the migration in said opposite direction of said first migration member -- said second migration member -- this -- it projects from the first conclusion object -- making -- this -- by making the second migration member engage with the engagement section of said second conclusion object In the fastener which clamps the these firsts and second conclusion objects, and concluded said two members mutually Prepare the projection section which has the contact side which counters said first migration member in said first conclusion object in said opposite direction at said second conclusion object, and by migration in this opposite direction of the migration member of this first said second conclusion object is contacted in the contact side of this projection section -- making -- this -- the fastener characterized by constituting so that the second conclusion object can be projected in this opposite direction.

[Claim 2] On the conclusion object of the either said first conclusion object or said second conclusion object While the heights or the crevice which gives said fitting side of one [this] conclusion object is prepared Corresponded to the conclusion object of any of them, or another side in the heights or the crevice established in one [this] conclusion object. the crevice or heights which gives said fitting side of the conclusion object of this another side prepares -- having -- this -- the first conclusion object -- this -- the fastener according to claim 1 in which the second conclusion object is not in the heights prepared in them, respectively, and a crevice and which is constituted so that wax fitting may be carried out.

[Claim 3] Have said contact side where said projection section in said first migration member counters in said opposite direction to said engagement section in said second conclusion object, and it is constituted, and by migration in this opposite direction of said first migration member the contact side of said projection section makes this engagement section contact -- having -- this -- the fastener according to claim 1 or 2 which the second conclusion object can project now in this opposite direction.

[Claim 4] When the extension section prolonged in said opposite direction is prepared in said first migration member in said first conclusion object and said second conclusion object is extrapolated at this extension section this, while the second conclusion object and said first conclusion object are constituted so that it may be made to fit in mutually in said each fitting side A fastener given in any of claim 1 which consists of sleeves by which said projection section is fixed to said extension section of the migration member of this first in the condition

of having extrapolated thru/or claim 3 they are.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the fastener which can conclude two predetermined members promptly and easily, and relates to the fastener which may be used suitable to conclude mutually the base element especially attached in machine tool tables, such as a machining center, and the fixture plate with which a predetermined fixture is fixed.

[0002]

[Background of the Invention] Conventionally, as a fastener for concluding two members, there is a thing of various structures, and according to a configuration, an application, etc. of a member which should be concluded, it is used out of them, being chosen suitably. And there is a fastener used in machine tools, such as a machining center, as one of them in case the fixture plate with which various kinds of fixtures, such as a clamp holding the work piece which should be processed, and a vice, were fixed is concluded to a base element.

[0003] By the way, even if it is in the fastener for making a base element conclude this fixture plate, the thing of various structures is proposed and the fastener of the **** structure shown below is known especially as a thing excellent in the operability at the time of conclusion of a fixture plate and a base element.

[0004] That is, this fastener is formed in location immobilization to the base element and fixture plate by which opposite arrangement is carried out, respectively, and has these base element, the first conclusion object mutually constituted possible [fitting] in each fitting side which extends in the opposite direction of a fixture plate, and the second conclusion object. The first conclusion object is followed on migration in this opposite direction of the first migration member made to move in the opposite direction of a base element and a fixture plate, and this first migration member according to an operation of oil pressure, the spring force, etc. moreover, according to a cam mechanism etc. It is made to move in the right-angled direction to this opposite direction, and consists of the first conclusion object including the second migration member which projects/moves [level-luffing-motion]. the bottom of the projection condition of the second migration member [in / on the other hand / in the second conclusion object / this first conclusion object] -- this -- it has the engagement section which can engage with the second migration member, and is constituted. And under the condition of having made access migration carrying out in said opposite direction, and having made the first conclusion object and the second conclusion object fitting into it in each fitting side in the fastener of such a configuration By making the second migration member project from the first conclusion object by moving the first migration member in said opposite direction, and making it engage with said engagement section in the second conclusion object The base element and fixture plate with which the these firsts and second conclusion objects were clamped, with the first and second conclusion objects were fixed can be mutually concluded now.

[0005] Therefore, it sets to the conventional fastener made into writing **** structure.

Although the operability which conclusion of a base element and a fixture plate might be performed easily and promptly, and was excellent only in moving the first migration member in said opposite direction by that cause at the time of conclusion of these base element and a fixture plate may be demonstrated It was that in which the **** problem shown below is inherent on the other hand.

[0006] That is, if it is in this conventional fastener, in order to raise the precision of the conclusion location of a fixture plate and a base element In many cases, mutually, prepare heights and the crevice corresponding to the first conclusion object and the second conclusion object, and the first and second conclusion objects are set to each fitting side of these heights and a crevice, respectively. By [which are not required mutually] carrying out wax fitting, it is prevented as much as possible in the fitting condition of the first conclusion object and the second conclusion object that the these firsts and second conclusion objects cause a location gap in the right-angled direction to said opposite direction. However, if tolerance of such wax fitting that is not is made severe to remainder When the path clearance prepared between the fitting sides of heights and a crevice is small to remainder, each fitting sides of these heights and a crevice are made close, and the first and second fitting conditions of a conclusion object must no longer have been canceled easily. That is, by it From the place when the smooth operability at the time of making conclusion of the first and second base elements with a conclusion object and fixture plates cancel will be spoiled greatly This path clearance was made into the magnitude with the so-called "play" which is extent to which each fitting sides of heights and a crevice are not made close. Therefore, in the conventional fastener, it was not avoided that the first conclusion object and the second conclusion object cause a location gap in the right-angled direction to the opposite direction of a base element and a fixture plate only in the part of the starting "play."

[0007] So, the demand was not able to be made to fully satisfy even if a higher precision was searched for about the conclusion location of these base element and a fixture plate, although it sets to the fastener of the writing ***** former and the operability at the time of discharge of the conclusion condition of a base element and a fixture plate may be secured advantageously.

[0008]

[Problem(s) to be Solved] The place which this invention makes the above-mentioned ***** situation a background, succeeds in it in here, and is made into the solution technical problem Under the condition to which it has the first conclusion object and the second conclusion object which are prepared in location immobilization to each of two members which should be concluded, and fitting of the conclusion object of them first and the second conclusion object was carried out mutually In the fastener which concluded said two members mutually by clamping the first and second conclusion objects The fitting condition to which the first conclusion object and the second conclusion object were made mutually close in each fitting side by accomplishing so that it may be canceled easily and promptly It is in offering the new structure of the fastener which may have been further raised in the precision of the conclusion location of these two members, securing effectively the smooth operability of conclusion of two members which should be concluded, and its discharge.

[0009]

[Means for Solution] And if it was in this invention, were separately prepared in the opposed face side of two members which should be concluded for solution of this technical problem at location immobilization, respectively. this, while having mutually the first and second conclusion objects which can fit in in each fitting side which extends in the opposite direction of two members The first migration member made to move the conclusion object of this first in this opposite direction, Are made to move in the right-angled direction to this opposite direction, and while constituting from a conclusion object of this first including the second migration member which projects/moves [level-luffing-motion], said second conclusion object is received. The engagement section which can engage with the second migration member is prepared. the bottom of the projection condition of the second migration member in said first conclusion object -- setting -- this -- this -- the first conclusion object -- this -- under the condition of having made access migration carrying out in said opposite direction, and having made the second conclusion object fitting into it in said fitting side the migration in said opposite direction of said first migration member -- said second migration member -- this -- it projects from the first conclusion object -- making -- this -- by making the second migration member engage with the engagement section of said second conclusion object In the fastener which clamps the these firsts and second conclusion objects, and concluded said two members mutually Prepare the projection section which has the contact side which counters said first

migration member in said first conclusion object in said opposite direction at said second conclusion object, and by migration in this opposite direction of the migration member of this first said second conclusion object is contacted in the contact side of this projection section -- making -- this -- let the fastener characterized by constituting so that the second conclusion object can be projected in this opposite direction be the summary.

[0010] Namely, if it is in the fastener according to such this invention The first migration member [in / only / in the bottom of the fitting condition of the first conclusion object and the second conclusion object / the conclusion object of this first] only by making it move in the opposite direction of two members which should be concluded The second migration member is made to project from the first conclusion object, and it is made to engage with the engagement section of the second conclusion object. By it The operability which was extremely excellent conventionally like equipment when making these two members conclude may be advantageously demonstrated from the place where the clamp of the first conclusion object and the second conclusion object is performed at, and two members which should be concluded are concluded.

[0011] In this fastener and under the conclusion condition of such first conclusion object and the second conclusion object especially By making it move in the direction in which the contact side of the projection section in which the first migration member was prepared by the migration member of this first in said opposite direction is made to contact the second conclusion object, i.e., the direction which goes to a second conclusion object side from a first conclusion object side The second conclusion object, for example by making severe first and second fit tolerance of a conclusion object from the place which can be projected now in this opposite direction in the projection section of the migration member of this first In the condition that each [these] fitting sides were made mutually close, path clearance between each fitting sides being used as magnitude without "play" Even if the first conclusion object and the second conclusion object are made to fit in Only by performing the same easy actuation as the time of concluding said two members of making the first migration member move in said opposite direction, and projecting the second migration member by the projection section The first conclusion object of a fitting condition and the second conclusion object can break off their relationship easily, and the these firsts and second fitting conditions of a conclusion object may be canceled certainly and easily.

[0012] So, if it is in the fastener according to this this invention Without spoiling conventionally the smooth operability at the time of making said two members you were made to conclude cancel unlike equipment It becomes possible to make severer fit tolerance of the first conclusion object and the second conclusion object. It may be closed if there is no need of preparing path clearance with "play" between each first and second fitting sides of a conclusion object, effectively. By that cause It may be canceled advantageously that the these firsts and second conclusion objects cause a location gap only for the part of the "play" concerning the bottom of the fitting condition of the first conclusion object and the second conclusion object in the right-angled direction to said opposite direction.

[0013] Therefore, securing effectively the smooth operability of conclusion of two members which should be concluded, and its discharge, if it is in the fastener according to such this invention, the precision of the conclusion location of these two members may be raised much more advantageous, and the always stabilized location precision may be secured very effectively.

[0014] In addition, according to one of the desirable modes of a fastener according to this this invention On the conclusion object of the either said first conclusion object or said second conclusion object While the heights or the crevice which gives said fitting side of one [this] conclusion object is prepared Corresponded to the conclusion object of any of them, or another side in the heights or the crevice established in one [this] conclusion object. the crevice or heights which gives said fitting side of the conclusion object of this another side prepares -- having -- this -- the first conclusion object -- this -- the second conclusion object is not in the heights and the crevice which were established in them, respectively -- it will be constituted so that wax fitting may be carried out.

[0015] By succeeding in the path clearance between each fitting sides of the heights which are

not mutually, for example and which carry out wax fitting, and a crevice with magnitude without "play", if such a configuration is adopted It is prevented further much more certainly that the first and second conclusion objects cause a location gap in the right-angled direction to said opposite direction, it obtains, and the precision of the conclusion location of two members which should be concluded may be raised much more effectively.

[0016] According to one of the advantageous modes of a fastener according to this invention, moreover, said projection section in said first migration member Have said contact side which counters in said opposite direction to said engagement section in said second conclusion object, and it is constituted, and by migration in this opposite direction of said first migration member the contact side of said projection section makes this engagement section contact -- having -- this -- the second conclusion object is constituted so that it may project in this opposite direction.

[0017] If it is in the fastener which has such a configuration Since the projection-ed part of the second conclusion object projected in the projection section of the first migration member consists of the engagement sections of the second conclusion object which engages with the second migration member in which migration of the first migration member carries out projection migration from the first conclusion object, It is not necessary to prepare this projection-ed part specially to the second conclusion object, and the structure of the second conclusion object, as a result the whole equipment may be advantageously simplified only for the part.

[0018] Furthermore, when according to one of the desirable modes of a fastener according to this invention the extension section prolonged in said opposite direction is prepared in said first migration member in said first conclusion object and said second conclusion object is extrapolated at this extension section this -- while the second conclusion object and said first conclusion object are constituted so that it may be made to fit in mutually in said each fitting side -- said projection section -- this -- it consists of sleeves fixed to said extension section of the first migration member in the condition of having extrapolated.

[0019] If it is in the fastener which has this configuration, when the second conclusion object is extrapolated by the extension section of the first migration member in the first conclusion object From the place into which the first conclusion object and the second conclusion object are made to fit mutually, by extrapolation actuation of the second [to the extension section of the first migration member] conclusion object It may be positioned easily and these firsts and second fitting actuation of a conclusion object may be performed more certainly and smoothly by it so that each fitting side of the first conclusion object and the second conclusion object may correspond mutually. Moreover, the projection section of the first migration member is fixed after the extension section of such first migration member has extrapolated. With this extension section, it differs from the case where the projection section is really fabricated to the first migration member, from the place which consists of sleeves of another object. An arrangement location, its magnitude, configuration of the projection section to the first migration member, etc. may be independently determined as the design of the first migration member. By it The advantage that the design degree of freedom of the first migration member, as a result the whole equipment can extend effectively will be acquired.

[0020] moreover, another desirable voice of the fastener according to this invention -- according to one [like], said first migration member according to each first and second energization force of an energization means While consisting of the first and second piston members which are made to move to the one side of said opposite direction, and are made to move to a reverse side direction with the migration direction by the this first and second energization means by oil pressure Said second migration member by migration in the migration direction by the energization means of this first of the piston member of this first Under the condition of being made moving in the right-angled direction to this opposite direction, being constituted so that it may be made projecting from said first conclusion object, and having made the conclusion object of this first, and said second conclusion object fitting in in said fitting side By making the piston member of this first move in the migration direction by the energization force of said first energization means, and making said second migration member project from the conclusion object of this first this -- by making said second piston member

move in the migration direction by the energization force of said second energization means, while making the second migration member engage with the engagement section of said second conclusion object this -- it was made to engage with the engagement section of the second conclusion object -- this -- the second migration member -- this -- it will press in the second piston member, and it will be constituted so that the said first and second conclusion objects may be clamped.

[0021] If it is in the fastener which has such a configuration, to the first and second piston members which constitute the first migration member, predetermined oil pressure is made to act, and the oil pressure is only canceled, and first and second clamps of a conclusion object and unclamping can be performed more easily and promptly.

[0022] Moreover, in this fastener, projection migration of the second migration member is carried out. Setting up greatly enough so that the second migration member can carry out projection migration of the migration stroke of the first piston member made to engage with the engagement section of the second conclusion object certainly By pressing the second migration member made to engage with the engagement section, while succeeding in the area of the pressure acceptance side small It can succeed in the migration stroke small, setting up greatly the area of the pressure acceptance side of the second piston member which clamps the first and second conclusion objects in comparison so that bigger oil pressure may be done. By it It compares, when it constitutes the first migration member from one piston member which has a big migration stroke and the area of a big pressure acceptance side. It becomes possible to stop advantageously the amount of pressure oil required to resist the energization force of an energization means and move a piston member in said opposite direction few. and -- consequently, without using the large-sized hydraulic pump which carries out the regurgitation of the pressure oil to a large quantity, it is alike and small and supply and its blowdown into the equipment of a small quantity of the pressure oil using an economical hydraulic pump can perform first and second clamp actuation of a conclusion object and unclamping actuation.

[0023] Therefore, if it is in the fastener of a writing **** configuration, it not only can perform more easily and promptly conclusion and its discharge of two members which should be concluded, but it becomes possible to hold down the activity cost low effectively.

[0024] In addition, such, while constituting the first migration member from the first piston member and the second piston member In succeeding in the these firsts and second piston members so that it may be made to move in said opposite direction with the structure like **** Give the first oil pressure room which makes said oil pressure exerted on the shank of said second piston member to said first piston member produce by installation of pressure oil advantageously. The cylinder part which consists of an insertion hole which extends in shaft orientations is prepared. The piston member of this first in the cylinder part of this second piston member according to the energization force of said first energization means With the oil pressure which is made to move to said opposite direction one side, and is made to act by the oil pressure interior of a room of this first While being arranged so that it may be made to move to a reverse side direction with the migration direction by the energization means of this first Said first conclusion object has further the cylinder part material which gives the second oil pressure room said oil pressure done to said second piston member is made to act on by installation of pressure oil, and is constituted. the inside of this cylinder part material -- this -- the second piston member according to the energization force of said second energization means you make it move to said opposite direction one side -- having -- and -- this -- the oil pressure made to act by the second oil pressure interior of a room -- this -- with the migration direction by the second energization means, it will be arranged so that it may be made to move to a reverse side direction.

[0025] If such a configuration is adopted, the second piston member in the condition of having been arranged in predetermined cylinder part material the first piston member -- this, since it will be arranged in same axle in the cylinder part prepared in the shank of the second piston member As compared with the case where the piston member of them first and the second piston member are estranged and arranged in a longitudinal direction or the vertical direction, the magnitude of the whole equipment is miniaturized and it may be constituted by the compact in comparison.

[0026] moreover, under the arrangement condition of such the first and the second piston Preferably, while said a part of shank [at least] in said second piston member is made to project from said cylinder part material by the method of outside The breakthrough which penetrates this side attachment wall on the side attachment wall of said cylinder part in the projection part of this shank, and is prolonged in a right-angled direction on it to said shaft orientations is formed. By furthermore, migration in the migration direction are arranged in this breakthrough movable in the direction in which this breakthrough is prolonged by said second migration member, and according to said first energization means of said first piston member within this cylinder part By making this second migration member move in the direction in which it is prolonged in the inside of this breakthrough, and making it project from opening of this breakthrough, it is constituted so that it may be made to project from said first conclusion object.

[0027] According to the writing **** configuration, the second migration member is arranged in the breakthrough of the cylinder part in the second piston member. Through this breakthrough from the place which will be constituted so that it may project/level-luffing-motion move in the right-angled direction to the shaft orientations of the first piston member It is not necessary to provide the arrangement tooth space of the second migration member apart from the first and second arrangement tooth spaces of a piston member, and small [of the whole equipment] and miniaturization may be attained more by it at validity.

[0028] [when the arrangement structure of this second migration member is adopted] furthermore, desirably When said second conclusion object is extrapolated from said cylinder part material of said shank in said second piston member to a projection part this -- while being made to fit in mutually in said each fitting side, the second conclusion object and said first conclusion object Said second migration member by migration in the migration direction by said first energization means of said first piston member While it is constituted so that it may be made to project from opening of said breakthrough by the method of outside said engagement section in said second conclusion object -- this -- said projection part of the second piston member is received -- this -- to the extrapolation part of the second conclusion object In a right-angled direction, it is projected and prepared in the method of inside to said opposite direction, and said projection section has further said contact side which counters in this opposite direction to this engagement section. this -- it prepares in the second piston member -- having -- this -- the contact side of said projection section makes this engagement section contact by migration in this opposite direction of the second piston member -- having -- this -- the second conclusion object is constituted so that it may project in this opposite direction.

[0029] If it is in the fastener which has such a configuration, it may be positioned easily and these firsts and second fitting actuation of a conclusion object may be performed more certainly and smoothly by it so that the second conclusion object may only be extrapolated to the projection part of the second piston member and each fitting side of the first conclusion object and the second conclusion object may correspond mutually. Moreover, it is not necessary to the second conclusion object to prepare specially the part projected in the projection section from the place prepared so that the projection section can project the engagement section of the second conclusion object to the second piston member, and the advantage that simplification of the structure of the second conclusion object, as a result the whole equipment may be advantageously attained by it is acquired.

[0030]

[Embodiment of the Invention] Suppose that it explains to a detail, referring to a drawing about the concrete configuration of the fastener concerning this invention hereafter, in order to clarify this invention still more concretely.

[0031] First, it has the structure of following this invention in drawing 1 , and an example of the fastener used in order to conclude mutually the base element and fixture plate which are attached in the table of machine tools, such as a machining center, is roughly shown in it. So that clearly also from this drawing 1 a fastener It has the first conclusion object 10 and the second conclusion object 12, and is constituted. The first conclusion object 10 It is prepared in location immobilization to the base element 13 caudad located in the vertical direction among the fixture plate 11 by which opposite arrangement was carried out, and the base element 13,

and the second conclusion object 12 is formed in location immobilization to the fixture plate 11 located up. And it consists of under the condition which carries out wax fitting of having not set the conclusion object 10 of them first, and the second conclusion object 12 in the vertical direction so that these fixture plate 11 and the base element 13 can be concluded.

[0032] The first conclusion object 10 which constitutes this fastener specifically [in the cylinder part material 14 fixed to the base element 13, and this cylinder part material 14] shaft orientations -- the upper and lower sides -- the interior of the large piston 16 as second piston member arranged movable, and this large piston 16 -- setting -- shaft orientations -- the upper and lower sides -- it changes, including further the small piston 18 as first piston member arranged movable.

[0033] Moreover, the cylinder part material 14 has the barrel section 20 which presents the shape of an abbreviation one side closed-end cylindrical shape of the shallow bottom which carries out opening toward the upper part, and the head section 22 which presents a heavy-gage approximate circle plate configuration. And as the circular feed hole 28 penetrates this center section in the head section 22 of this cylinder part material 14, and is established in that center section at it, and the cylindrical projection 30 which has the same bore as a feed hole 28 in the opening edge of this feed hole 28 has predetermined height from this opening edge and it begins to extend in the vertical upper part, it is set up in one. In addition, this cylindrical projection 30 is set in case [in which said second conclusion object 12 is not] wax fitting is carried out. this -- opposite with said fixture plate 11 with which it is formed as heights inserted in the crevice established in the second conclusion object 12, and the peripheral face should be concluded, and said base element 13 -- a direction -- it considers as the first conclusion object side fitting side 31 which extends toward up down (the direction of a vertical) one.

[0034] And cover the up opening to the barrel section 20, and while bolt immobilization is carried out, such the head section 22 The barrel section 20 with the mounting bolt arranged in two or more flange projections which protruded horizontally to the peripheral face While being constituted with the approximate circle column configuration in the air in which it is being fixed to the top face of the base element 13, with the cylinder part material 14 carries out opening to the upper part in a feed hole 28, it is prepared in location immobilization to the top face of the base element 13. Moreover, in this cylinder part material 14, ***** 24 penetrated in the thickness direction is formed, and gets down from it to the barrel wall section of the barrel section 20, and pressure oil is supplied in the cylinder part material 14 by connecting this ***** 24 to the hydraulic pump which is not illustrated.

[0035] On the other hand, the large piston 16 is presenting the shape of a cylindrical shape with **** of the shape of longitudinal-section reverse of T characters by which the lower part was major-diameter-ized as a whole. While the lower part equivalent to the head of T characters is made into the sliding section 32 which has an outer diameter slightly smaller than the bore of the barrel section 20 in the cylinder part material 14 Let the up part equivalent to the leg of T characters be the shank 34 which has an outer diameter smaller enough than the diameter of opening of the feed hole 28 of the head section 22 in the cylinder part material 14. Such a large piston 16 in and the condition of having made the sliding section 32 hold in the barrel section 20 of the cylinder part material 14, and having made the up part of a shank 34 projecting up through the feed hole 28 of the head section 22 of this cylinder part material 14 In the peripheral face of the sliding section 32, sliding on the inner skin of the barrel section 20, it may be made as it moves up and down in shaft orientations, and it is arranged in the cylinder part material 14. Moreover, it considers as the large oil pressure room 36 as second oil pressure room the pressure oil with which the space which the underside of the sliding section 32 and the inner surface of the cylinder part material 14 come to surround is supplied in the cylinder part material 14 (barrel section 20) through the aforementioned style oil gallery 24 by the migration to the upper part of this large piston 16 under the arrangement condition into the cylinder part material 14 of such a large piston 16 is made to introduce.

[0036] Moreover, the insertion hole 38 which penetrates a shank 34 and the sliding section 32 to shaft orientations, and is prolonged is formed in the core of the large piston 16 arranged in the cylinder part material 14. This insertion hole 38 consists of the circular hole with a stage

with which the connection 44 which connects the shank side opening 40 and the sliding section side opening 42 was formed into the predetermined dimension minor diameter rather than the double door regio oralis 40 and 42. If it is in such an insertion hole 38, to and the thread part prepared in the up inner skin of the shank side opening 40 While the lid 41 is screwed, to the part which penetrates the sliding section 32, i.e., the lower part of the insertion hole 38 including some connections 44 which follow the sliding section side opening 42 and it the inside configuration of this part -- a 1-round person -- the lock out metallic ornaments 46 which present a similar small configuration are inserted in same axle, and bolt immobilization is carried out, with the upside and bottom opening of the insertion hole 38 are made to blockade by these lids 41 and the lock out metallic ornaments 46, respectively

[0037] Moreover, it is arranged in the lower part of the insertion hole 38, and the lock out metallic ornaments 46 which blockade the bottom opening have the breakthrough 48 which penetrates the core in the vertical direction. furthermore, the breakthrough 48 of these lock out metallic ornaments 46 -- that up opening -- a predetermined dimension -- thin -- smallness -- it considers as the constriction opening 50 it comes-izing [opening], and while the ball valve 52 which has a bigger path than the diameter of opening of the constriction opening 50 in a lower opening side smaller enough than that bore is held in the vertical direction movable, the helical compression spring 54 which energizes this ball valve 52 up is arranged. And to this ball valve 52, unless bigger external force than the energization force of a helical compression spring 54 has ***** straw As opposed to a ball valve 52 the constriction opening 50 in the breakthrough 48 of the lock out metallic ornaments 46 -- a ball valve 52 -- liquid, while being made to blockade densely Bigger external force than the energization force of a helical compression spring 54 in the ***** case A ball valve 52 resists the energization force of a helical compression spring 54, and is made to move caudad. Lock out of the constriction opening 50 by the ball valve 52 is canceled, with the constriction opening 50 carries out opening toward the inside of the connection 44 of said insertion hole 38, and the insertion hole 38 goes caudad and carries out opening.

[0038] furthermore, in the sliding section 32 of the large piston 16 which gives the lower part of the insertion hole 38 in which the writing ***** lock out metallic ornaments 46 are arranged ***** 58 which makes the lower part of ***** 24 and this insertion hole 38 in the barrel section 20 of said cylinder part material 14 open for free passage is formed, and the pressure oil supplied in the barrel section 20 from this ***** 24 is led in this insertion hole 38 through this ***** 58. Thereby, like the above-mentioned, it carries out, and only within the case where the lock out by the ball valve 52 of the constriction opening 50 of said lock out metallic ornaments 46 is canceled, the pressure oil led in the insertion hole 42 passes along the breakthrough 48 of these lock out metallic ornaments 46, and is supplied in said large oil pressure room 36.

[0039] moreover, in the top face of the sliding section 32 of the large piston 16 The circular slot 62 on the shallow bottom is formed so that a shank 34 may be surrounded. Further in this circular slot 62 In the circular hole prepared in each core, it holds and the belleville spring 64 as first energization means is arranged so that it may go caudad and this large piston 16 may be energized in the condition that you were made to extrapolate by the shank 34 of the large piston 16.

[0040] in this way -- the inside of the cylinder part material 14 -- setting -- the upper and lower sides -- under the migration condition to such a lower part, while the large piston 16 arranged movable is made to move caudad by the energization force of a belleville spring 64 When the pressure oil introduced in the insertion hole 38 through ***** 24 and ***** 58 is supplied in the large oil pressure room 36 through the breakthrough 48 of the lock out metallic ornaments 46 and oil pressure is made to act in this large oil pressure room 36 You resist the energization force of a belleville spring 64, and it is made to move up.

[0041] In addition, by consisting of undersides of the sliding section 32 of a major diameter where the pressure acceptance side of the large piston 16 constitutes a part of wall surface which forms said large oil pressure room 36 here Area of the pressure acceptance side of this large piston 16 is enlarged enough. Moreover, the height of the sliding section 32 made to move in the vertical direction in the inside of the cylinder part material 14 By being slightly made

smaller than the distance between the undersides of the head section 22 and the top faces of the barrel section 20 which counter in the vertical direction in this cylinder part material 14, the migration stroke of this large piston 16 is made small in comparison.

[0042] On the other hand, the small piston 18 is presenting the shape of a cylindrical shape with **** by which the part of upside one half was major-diameter-ized as a whole. While considering as the shank 74 which has an outer diameter only with the major diameter of upside one half smaller enough than the bore of said shank side opening 40 in said insertion hole 38 It considers as the sliding section 76 which has an outer diameter only with the narrow diameter portion of bottom one half slightly smaller than the bore of said connection 44 in this insertion hole 38. And such a small piston 18 sliding at least on the point of the sliding section 76 in the peripheral face of this sliding section 76 at the inner skin of a connection 44 in the condition that you made it rush in into the connection 44 of the insertion hole 38, it may be made as it moves up and down in shaft orientations, and it is inserted in in the shank side opening 40 of this insertion hole 38, and is arranged. Moreover, space in the connection 44 of the insertion hole 38 formed between the underside of the sliding section 76 and the top face of the lock out metallic ornaments 46 is made the small oil pressure room 78 as first oil pressure room to which the pressure oil led to the inside of the insertion hole 38 is supplied by the migration to the upper part within the insertion hole 38 of this small piston 18.

[0043] And opening is carried out to the upper part, the spring hold hole 84 which extends in shaft orientations is established in the core of such a shank 74 of the small piston 18, and hold arrangement is carried out in the condition that the helical compression spring 86 as second energization means goes caudad, and energizes the small piston 18 in this spring hold hole 84.

[0044] in this way -- the inside of the insertion hole 38 of the large piston 16 -- setting -- the upper and lower sides, if it is in the small piston 18 arranged movable While being made to move caudad by the energization force of a helical compression spring 86, it sets under the migration condition to such a lower part. You resist the energization force of a helical compression spring 86, and it is made to move up, when the pressure oil introduced in the insertion hole 42 through ***** 24 and ***** 58 is supplied in the small oil pressure room 78 and oil pressure is made to act in this small oil pressure room 78.

[0045] In addition, the migration stroke of the small piston 18 is made larger enough than the migration stroke of said large piston 16 here. Moreover, by consisting of undersides of the sliding section 76 of the minor diameter which constitutes a part of wall surface where the pressure acceptance side of the small piston 18 forms the small oil pressure room 78 in the connection 44 of the minor diameter in the insertion hole 38 Area of the pressure acceptance side of this small piston 18 is made small enough as compared with it of the large piston 16.

[0046] In this operation gestalt, the large piston 16 and the small piston 18 therefore, under the condition that you were made to be located, respectively by the migration edge to a lower part When ***** 24 is connected to the hydraulic pump which is not illustrated and pressure oil is led to the insertion hole 38 through ***** 24 and ***** 58 from this hydraulic pump This pressure oil is supplied in the small oil pressure room 78, and with first, the comparatively small oil pressure made to act by supply of this pressure oil in the small oil pressure room 78 The small piston 18 resists the energization force to the lower part of said helical compression spring 86, and is made to move up with a big stroke.

[0047] Moreover, the helical compression spring 54 arranged in the breakthrough 48 of said lock out metallic ornaments 46 at this time Although it is not made to compress until pressure oil is full in the small oil pressure room 78, when pressure oil is superfluously supplied in the small oil pressure room 78 full of pressure oil Since it has the energization force of magnitude you are made to compress by the oil pressure which acts in this small oil pressure room 78 and is constituted, until the small piston 18 arrives at an upper migration edge It is carried out [that the constriction opening 50 of the lock out metallic ornaments 46 was freely made to blockade by the ball valve 52, and], and pressure oil does not flow in the large oil pressure room 36 (refer to drawing 4).

[0048] And if pressure oil is made full in the small oil pressure room 78 and the small piston 18 arrives at the migration edge to the upper part, the ball valve 52 in the breakthrough 48 of the lock out metallic ornaments 46 will resist the energization force of a helical compression spring

54, will be made to move caudad by the oil pressure in this small oil pressure room 78, and the lock out by the ball valve 52 of the constriction opening 50 in this breakthrough 48 will be canceled. The large piston 16 resists the energization force to the lower part of two belleville springs 64 and 64, and is made to move up by slight stroke by the big oil pressure on which pressure oil is supplied in the large oil pressure room 36 through this breakthrough 48, and is made by this to act in connection with it in the large oil pressure room 36. and the bulb between said hydraulic pumps and ***** 24 (not shown) is closed under the condition that pressure oil was made full in the large oil pressure room 36, and the large piston 16 was made to reach by the migration edge to the upper part -- carrying out -- ***** 24 -- liquid -- when blockaded densely, the constriction opening 50 is made to blockade again by the ball valve 52, as shown in drawing 1

[0049] In the bottom of the condition that the large piston 16 and the small piston 18 were made to be located on the other hand in this way, respectively by the migration edge to the upper part If said bulb is opened under a halt of a hydraulic pump and lock out of ***** 24 is canceled First, the small piston 18 is made to move caudad by the energization force of a helical compression spring 86, and in connection with it, the pressure oil in the small oil pressure room 78 passes along ***** 58, and is discharged outside from ***** 24 (refer to drawing 2). And if all the pressure oil in the small oil pressure room 78 is discharged and the small piston 18 arrives at the migration edge to a lower part By making the projection 82 prepared in the core of the underside of the small piston 18 rush in into the constriction opening 50 in the lock out metallic ornaments 46 The lock out by the ball valve 52 of this constriction opening 50 is canceled. The large piston 16 It is made to move caudad by the energization force of two belleville springs 64 and 64, and follows on it. The pressure oil in the large oil pressure room 36 is made to flow toward the inside of the small oil pressure room 78 through the breakthrough 48 of the lock out metallic ornaments 46, and is further discharged outside through ***** 58 and ***** 24 (refer to drawing 3). And when all the pressure oil in the large oil pressure room 36 is discharged, the large piston 18 is made to reach by the migration edge to a lower part.

[0050] In the fastener of this operation gestalt constituted so that it might be a place, thus size and the small pistons 16 and 18 might be made to move in the vertical direction the above-mentioned ****, although the large piston 16 arranged in the cylinder part material 14 is made to project up in the shank 34 through like and the feed hole 28 of the head section 22 in this cylinder part material 14 By the shank 34 of this large piston 16 having an outer diameter small enough, and consisting of paths of the feed hole 28 of this head section 22 The annular clearance 56 is formed between the inner skin of the feed hole 28 of these head section 22, and the peripheral face of the insertion part into the feed hole 28 of a shank 34.

[0051] moreover, in the shank 34 of the large piston 16, in the insertion part into the feed hole 28 of the head section 22 which forms said clearance 56 The sleeve 57 as the projection section which consists of cylinder metallic ornaments of thickness slightly smaller than the width of face of this clearance 56 is extrapolated. Further directly under the extrapolation part of this sleeve 57 The support disk 59 which has an outer diameter smaller than the path of the feed hole 28 of the head section 22 is being extrapolated and fixed in the condition of having set the periphery part horizontally and having made it projecting in said clearance 56. And by supporting the sleeve 57 extrapolated by this shank 34 by the periphery part of this support disk 59, it is in the condition that migration in a lower part was prevented, and is attached in the shank 34 of the large piston 16. Moreover, when the sleeve 57 attached in the shank 34 of this large piston 16 is made to be located in the large piston 16 especially here by the downward migration edge Have the height in which you may make it an upper bed side located so that it may become the upper bed side of said cylindrical projection 30 of the head section 22, and abbreviation flush, and it is constituted. furthermore, the time of said second conclusion object 12 being made for such an upper bed side of a sleeve 57 to conclude by the first conclusion object 10 -- this -- it considers as the contact side 61 adjacent to the underside (contact surface 96) of the engagement section projected part 92 which the second conclusion object 12 mentions later.

[0052] With this operation gestalt, the large piston 16 from the condition that you were made to

be located by the downward migration edge, in this way In the upper part, in connection with being made to move up, the up part of a sleeve 57 carries out projection migration from the inside of said clearance 56. Moreover, from the migration condition to such the upper part, the large piston 16 is made to move caudad and follows on **. When the projection part of a sleeve 57 carries out level-luffing-motion migration into said clearance 56 and the large piston 16 is made to be located by the migration edge It is made to be located in the contact side 61 of a sleeve 57 by the upper bed side and abbreviation flush of said cylindrical projection 30 of the head section 22.

[0053] moreover, in here, in the projection part to the upper part from the feed hole 28 of said head section 22 in the shank 34 of the large piston 16 by which extrapolation immobilization of the sleeve 57 like **** was carried out The breakthrough 68 which penetrates this barrel wall to two or more places of the same height of a barrel wall which give the shank side opening 40 of said insertion hole 38, and is prolonged in a right-angled direction in them to a horizontal direction, i.e., the opposite direction of said fixture plate 11 and said base element 13, is formed, respectively. And into each [these] breakthrough 68, hold arrangement of the steel ball 70 as second migration member is carried out in the condition that it slides or rolls and one may be made to move at a time to the extension direction slack horizontal direction of each breakthrough 68, respectively. Each [these] steel ball 70 has predetermined dimension size *****, and consists of extension lay length dimensions of a breakthrough 68. Moreover, by it In the condition that you are not made to project in any way from peripheral face side opening of the shank 34 in a breakthrough 68 On the other hand (refer to drawing 1), a part is made to project from a shank 34 in the condition that you are not made to project in any way from inner skin side opening of the shank 34 in a breakthrough 68 whose part is made to project in the shank side opening 40 by the side (refer to drawing 2). In addition, 72 and 72 are the rubber rings for preventing balking out of each breakthrough 68 of each steel balls 70 and 70, and 68 among drawing 1 .

[0054] On the other hand, the lobe 88 which follows a predetermined height projection and a hoop direction, and is prolonged is formed in the direction of a path at the upper bed section of the shank 74 of the small piston 18. This lobe 88 is made into the press side 90 where that underside presents the taper side configuration which serves as a major diameter gradually as it goes up while it is made into the maintenance side 89 which has an outer diameter with that peripheral face slightly smaller than the bore of the shank side opening 40 in the insertion hole 38 of the large piston 16.

[0055] In the condition that ** (ed) and such a small piston 18 was made to be located here by the upper migration edge It is made to be located in the press side 90 of this lobe 88 by the same height as each breakthrough 68 prepared in the shank 34 of the large piston 16. It is made to contact the projection part into the shank side opening 40 of each steel ball 70 arranged in each breakthrough 68 of the shank 34 of the large piston 16 (refer to drawing 1 and drawing 4). By migration in the lower part of this small piston 18, and each steel ball 70 When it is horizontally pressed in respect of [90] the press made into the taper side configuration like the above-mentioned, and is made to move toward the method of outside in the inside of each breakthrough 68 and the small piston 18 arrives at a downward migration edge While each steel ball 70 is made to project selectively from a shank 34 through peripheral face side opening of the shank 34 in a breakthrough 68 by the side, such a projection condition is held in respect of [89] maintenance of a lobe 88 (refer to drawing 2).

[0056] On the other hand, the second conclusion object 12 is presenting the shape of a cylindrical shape as the whole which has the inner hole of the magnitude which can insert in the shank 34 of the large piston 16 in the first conclusion object 10. And if it is in the second conclusion object 12 of the shape of this cylinder, the engagement projected part 92 prolonged toward the method of the inside of the direction of a path succeeding a predetermined height projection and a hoop direction is formed at least in the shaft-orientations pars intermedia in the inner skin in one, and the crevice 93 which continues and extends to the lower part in inner skin by it in a hoop direction is formed.

[0057] Moreover, the engagement projected part 92 prepared in this second conclusion object 12 consists of the outer diameter of the shank 34 of the large piston 16 with the slightly big

bore, and while that top face is made into the engagement side 94 which has the taper side configuration which serves as a minor diameter gradually as it goes caudad, it is made into the contact surface 96 where that underside consists of the level surface. On the other hand, the crevice 93 established in the lower part of this engagement projected part 92 [in case / in which the second conclusion object 12 is not in the first conclusion object 10 / wax fitting is carried out] It is formed as an insertion part of said cylindrical projection 30 in the conclusion object 10 of this first. It considers as the second conclusion object side fitting side 95 where the inner skin is prolonged toward the opposite direction slack up down (the direction of a vertical) one of said fixture plate 11 which should be concluded, and said base element 13. Especially here in addition, under the wax fitting condition in which the first and second conclusion objects 10 and 12 are not So that path clearance between this second conclusion object side fitting side 95 and the first conclusion object side fitting side 31 given in the peripheral face of said cylindrical projection 30 may be made into magnitude without "play" if it puts in another way, it will be in the first and second conclusion object side fitting sides 31 and the **** condition to which 95 comrades are made mutually close -- as -- the bore of the second conclusion object side fitting side 95 -- the outer diameter of the first conclusion object side fitting side 31, and abbreviation -- the same dimension -- or **** -- it considers as the slightly big dimension.

[0058] And such second conclusion object 12 is attached in location immobilization to the underside of the fixture plate 11 with two or more mounting bolts arranged by the outside flange really formed in the lower peripheral face.

[0059] By the way, when the fastener of this operation gestalt which has the first conclusion object 10 made into the second conclusion object 12 and the structure like the above-mentioned of having a writing **** configuration is used, conclusion with the fixture plate 11 and the base element 13 and its discharge will be performed as follows, for example.

[0060] That is, the opposite arrangement of the fixture plate 11 and the base element 13 is made to carry out in the vertical direction first, so that the second conclusion object 12 and the first conclusion object 10 which were fixed to them, respectively may estrange mutually and it may be located in same axle as shown in drawing 1 . And by carrying out [above-mentioned] like [****] and making pressure oil full in the inside of the large oil pressure room 36 of the first conclusion object 10 fixed to the base element 13, and the small oil pressure room 78 under such an arrangement condition While resisting the energization force of a belleville spring 64 and a helical compression spring 86 and making it the large piston 16 and the small piston 18 located in the migration edge to the upper part, respectively Make the steel ball 70 in each breakthrough 68 of the large piston 16 project in the shank side opening 40 of the insertion hole 38 in which it was prepared by this large piston 16, and you make the press side 90 in the shank 74 of the small piston 18 contact in the projection part, and make it located. In addition, each steel ball 70 does not need to be made not to be made to project in any way from the first conclusion object 10 at this time by that side. Moreover, the up part will carry out [the upper part] the projection location of the sleeve 57 by which extrapolation immobilization was carried out at the shank 34 of the large piston 16 from the inside of the feed hole 28 of the head section 22 in the cylinder part material 14.

[0061] Subsequently, as shown in drawing 2 , in the vertical direction, access migration of the second conclusion object 12 and the first conclusion object 10 is carried out mutually. Extrapolating the second conclusion object 12 to the projection part of the shank 34 of the large piston 16 made to project from the cylinder part material 14 of the first conclusion object 10 this -- in the second conclusion object side fitting side 95 in said crevice 93 of the second conclusion object 12, and the first conclusion object side fitting side 31 of the cylindrical projection 30 in the first conclusion object 10, the first conclusion object 10 and the second conclusion object 12 are not -- wax fitting is carried out. The extension section of the first migration member consists of shanks 34 of the large piston 16 here so that clearly from this.

[0062] In addition, the contact surface 96 of the engagement projected part 92 in the second conclusion object 12 makes the fitting location of the first conclusion object 10 at this time, and the second conclusion object 12 the location made to contact the contact side 61 of the sleeve 57 extrapolated by the shank 34 of the large piston 16 in the first conclusion object 10.

Moreover, it considers as the **** condition to which the first conclusion object side fitting side 31 and the second conclusion object side fitting side 95 are made mutually close, with the relative displacement to all the right-angled directions over the mutual opposite direction of the first conclusion object 10 and the second conclusion object 12 may be made to prevent effectively under such a fitting condition.

[0063] Then, under the fitting condition of this first conclusion object 10 and the second conclusion object 12, by canceling the state of obstruction of ***** 24 in the first conclusion object 10, the small piston 18 is made to move caudad according to the energization force of a helical compression spring 86, and the pressure oil in the small oil pressure room 78 is discharged outside through ***** 58 and ***** 24. Moreover, each steel ball 70 made to project like the above-mentioned with migration in the lower part of this small piston 18 with it in the shank side opening 40 of said insertion hole 38 is pressed according to the press side 90 of the lobe 88 of the small piston 18. it moves in the inside of each breakthrough 68 -- making -- a part of each [these] steel ball 70 of each -- a part is made to project from the shank 34 10 of the large piston 16, i.e., the first conclusion object, in the side through peripheral face side opening of the shank 34 in a breakthrough 68 And the projection part of each steel ball 70 is made to engage with the engagement side 94 of the engagement projected part 92 in the second conclusion object 12 by moving the small piston 18 below further and making it arrive at a downward migration edge. In addition, each steel ball 70 sets at least to a reverse flank with that projection side, and is made to contact the maintenance side 89 of the lobe 88 of the small piston 18, and the projection condition from the first conclusion object 10 of each steel ball 70 is made to hold at this time by it.

[0064] Subsequently, by carrying out like **** and making the small piston 18 arrive at a downward migration edge, as shown in drawing 3 While canceling the lock out by the ball valve 52 of the constriction opening 50 and making the large piston 16 move caudad according to the energization force of two belleville springs 64 and 64 The pressure oil in the large oil pressure room 36 is made to flow toward the inside of the small oil pressure room 78 through the breakthrough 48 of the lock out metallic ornaments 46, and is further discharged outside through ***** 58 and ***** 24. It follows on migration in the lower part of such a large piston 16. And by the upside inner skin of each breakthrough 68 of the large piston 16 Each steel ball 70 is pressed caudad and the engagement side 94 of the engagement projected part 92 in the second conclusion object 12 made to engage with each [these] steel ball 70 is depressed. By it this -- the contact surface 96 of this engagement projected part 92 moves the second conclusion object 12 further caudad to the location made to contact the upper bed side of the cylindrical projection 30 in said cylinder part material 14.

[0065] In addition, the sleeve 57 by which extrapolation immobilization was carried out to the shank 34 of the large piston 16 at this time Level-luffing-motion migration is carried out into said clearance 56 formed between the peripheral face of this shank 34, and the inner skin of the feed hole 28 of the head section 22 in the cylinder part material 14. By attainment to the migration edge of the lower part of this large piston 16 It is made to be located in the contact side 61 of a sleeve 57 by the upper bed side and abbreviation flush of said cylindrical projection 30 of the head section 22. Moreover, although each steel ball 70 receives the applied force which acts toward the inside of the shank side opening 40 of said insertion hole 38 under migration of such a large piston 16 based on the reaction force of the thrust to the engagement side 94 made into the taper side configuration of the engagement projected part 92, migration into the insertion hole 38 is prevented by the contact to said maintenance side 89.

[0066] And the contact surface 96 of the engagement projected part 92 in the second conclusion object 12 thus, under the condition of having made the upper bed side of the cylindrical projection 30 of the cylinder part material 14 contact By pressing caudad the engagement side 96 of this engagement projected part 92 with each steel ball 70 This engagement projected part 94 is clamped between each steel ball 70 and the cylindrical projection 30 of the cylinder part material 14. the base element 13 to which the first and second conclusion objects 10 and 12 were clamped, with the first conclusion object 10 was fixed, and the fixture plate 11 with which the second conclusion object 12 was fixed -- those opposite -- a direction -- up down one -- it is, and you are in an unmovable condition and

make it conclude mutually

[0067] Moreover, in order to cancel the conclusion condition of such a fixture plate 11 and the base element 13, the pressure oil supplied from a hydraulic pump etc. is introduced in the small oil pressure room 78 through ***** 24 and ***** 58, the energization force of a helical compression spring 86 is resisted, and the small piston 18 is made to move up first, with the oil pressure made to act in this small oil pressure room 78, as shown in drawing 4 . According to said applied force which is made to cancel contact on the maintenance side 89 of the lobe 88 of the small piston 18, and each steel ball 70, and is made to act to each [these] steel ball 70 like **** by it Level-luffing-motion migration of each steel ball 70 is carried out toward the inside of the shank side opening 40 of the insertion hole 38 into each breakthrough 68. With, while canceling the engagement of each steel ball 70 to the engagement side 94 of the engagement projected part 92 in the second conclusion object 12, the clamp of this engagement projected part 92 between each steel ball 70 and the cylindrical projection 30 of the cylinder part material 14 is also made to cancel.

[0068] As shown in drawing 5 , make it the small piston 18 located in the migration edge to the upper part, and each steel ball 70 subsequently, under the condition which carried out level-luffing-motion migration to the location which does not project at all in the side from the first conclusion object 10 Like and the lock out by the ball valve 52 of the breakthrough 48 of the lock out metallic ornaments 46 are canceled. supplying pressure oil further in said small oil pressure room 78 -- the above-mentioned **** -- Pressure oil is introduced in said large oil pressure room 36, the energization force of a belleville spring 64 is resisted and the large piston 16 is made to move up with the oil pressure made to act in this large oil pressure room 36. By this in respect of [61] the contact of a sleeve 57 by which extrapolation immobilization was carried out to the projection part from the feed hole 28 of the cylinder part material 14 in the shank 34 of this large piston 16 As the contact surface 96 of the engagement projected part 92 of the second conclusion object 12 which contacts it is pushed up, a fitting condition [in / for the second conclusion object 12 / the said first / of ejection with the first conclusion object 10, and the second conclusion object 12 / and second conclusion object side fitting sides 31 and 95] is broken off its relationship to the upper part.

[0069] And conclusion with the fixture plate 11 and the base element 13 is canceled by making it the second conclusion object 12 and the first conclusion object 10 displaced relatively in the vertical direction after that.

[0070] In this operation gestalt, the first conclusion object 10 and the second conclusion object 12 thus, under the condition which is not and which carries out wax fitting in the first and second conclusion object side fitting sides 31 and 95 The pressure oil in the small oil pressure room 78 and the large oil pressure room 36 is only discharged, the these firsts and second clamps of the conclusion objects 10 and 12 are performed, and the fixture plate 11 and the base element 13 may be concluded easily and certainly.

[0071] If it is in this operation gestalt of this, and under the fitting condition of the such first and second conclusion objects 10 and 12 It considers as the first conclusion object side fitting side 31, the second conclusion object side fitting side 95, and the **** condition made mutually close. The first conclusion object 10 and the second conclusion object 12 from the place which the relative displacement to all right-angled directions can prevent now to the mutual opposite direction It may be prevented certainly that the these firsts and second conclusion objects 10 and 12 cause a location gap in this direction.

[0072] And if it is in this operation gestalt, it sets under the fitting condition of the first and second conclusion objects 10 and 12. While being made for the first and second clamps of the conclusion objects 10 and 12 to be solved by supplying pressure oil in the small oil pressure room 78 and the large oil pressure room 36 With the sleeve 57 fixed to the large piston 16 in the first conclusion object 10 The second conclusion object 12 is projected up. The these firsts and second dissolution of the fitting condition of the conclusion objects 10 and 12 In spite of considering as the first conclusion object side fitting side 31, the second conclusion object side fitting side 95, and the **** condition made mutually close like **** from the place which can be ensured now the first and second dissolutions of the clamp of the conclusion objects 10 and 12, simultaneously those fitting conditions may also be canceled certainly and very easily.

[0073] Therefore, securing effectively the smooth operability of conclusion of the fixture plate 11 and the base element 13, and its discharge, if the fastener concerning such this operation gestalt is used, the precision of the conclusion location of these fixture plate 11 and the base element 13 may be raised advantageously, and the always stabilized location precision may be secured very effectively.

[0074] Moreover, in this operation gestalt, access migration of the second conclusion object 12 and the first conclusion object 10 is mutually carried out in the vertical direction. Extrapolating the second conclusion object 12 to the projection part of the shank 34 of the large piston 16 made to project from the cylinder part material 14 of the first conclusion object 10 The these firsts and second conclusion objects 10 and 12 set to the first and second conclusion object side fitting sides 31 and 95. From the place which is not required mutually and which carries out wax fitting, only by the second conclusion object 12 making it extrapolate to the shank 34 of the large piston 16 It may be easily positioned so that the first and second conclusion object side fitting sides 31 and 95 may correspond mutually, with these firsts and second fitting actuation of the conclusion objects 10 and 12 may be performed more certainly and smoothly.

[0075] If it is in this operation gestalt, furthermore, by migration to the upper part of the large piston 16 Where migration in a lower part is prevented with the support disk 59 with which the sleeve 57 which thrusts up the second conclusion object 12 and breaks off its relationship the first and second fitting conditions of the conclusion objects 10 and 12 was fixed to the shank 34 of the large piston 16 This shank 34 extrapolates, this sleeve 57 is only variously exchanged from the place attached to that from which height differs, for example, and the height location at the time of the second conclusion object 12 being projected etc. can be changed easily.

[0076] If it is in this operation gestalt, in the second conclusion object 12, furthermore, the engagement projected part 92 with which each steel ball 70 is made to engage again From the place thrust up with said sleeve 57, in the second conclusion object 12, the part thrust up with a sleeve 57 is not established specially, but the structure of the second conclusion object 12, as a result the whole equipment may be advantageously simplified only for the part.

[0077] By moreover, migration to the upper part by the oil pressure made to act in this operation gestalt in the small oil pressure room 78 and the large oil pressure room 36 The inside of the small piston 18 of which the conclusion condition of the fixture plate 11 and the base element 13 is made to cancel, and the large piston 16, While the small piston 18 has a big migration stroke and the pressure acceptance side of a small area and is constituted From the place where the large piston 16 changes with the small migration stroke and the pressure acceptance side of a big area, in order for the conclusion condition of the fixture plate 11 and the base element 13 to make it cancel In the conventional fastener with which the total quantity of the pressure oil introduced in the small oil pressure room 78 and the large oil pressure room 36 comes to have one piston to which each of migration strokes and area of a pressure acceptance side was set greatly Rather than the amount of the pressure oil by which the need is carried out to making the conclusion condition of two concluded members cancel, it can stop few very effectively.

[0078] So, if it is in the fastener of this operation gestalt of this For example, when concluding the fixture plate 11 and the base element 13 of a large area, it sets. Even if plurality is used, it is not necessary to use pressure oil for a large quantity for the large-sized hydraulic pump in which the regurgitation is possible at all. By it It becomes possible to be able to raise workability advantageously, in case the fixture plate 11 and the base element 13 of these large areas are made to conclude, and to reduce the activity cost advantageously.

[0079] In this operation gestalt, the small piston 18 furthermore, in the insertion hole 38 formed in the shank 34 of the large piston 16 since it is arranged that it is movable and in same axle up and down in shaft orientations, the small piston 18 arranges in the first conclusion object 10, without taking a location -- having -- obtaining -- it -- the first conclusion object 10, as a result fastener whole -- advantageous -- small -- it may miniaturize.

[0080] If it is in this operation gestalt, furthermore, two or more steel balls 70 which carry out projection level-luffing-motion migration toward the side from the first conclusion object 10 again From the place arranged in two or more breakthroughs 68 formed in the shank 74 of the small piston 18 The arrangement tooth space of the small piston 18 and the large piston 16

does not independently need to provide the arrangement tooth space between two or more steel balls 70, and small [of the first conclusion object 10 and the whole fastener] and miniaturization may be attained more by it at validity.

[0081] As mentioned above, although the concrete configuration of this invention has been explained in full detail, this is only instantiation to the last, and this invention does not receive any constraint by the above-mentioned publication, either.

[0082] For example, although the second migration member was constituted from said operation gestalt by two or more steel balls 70 If it is constituted so that this second migration member may be made to move in the right-angled direction to the opposite direction of two members which should be concluded and it may project/level-luffing-motion move from the first conclusion object Even if the structure is not limited at all and constitutes [therefore] the second migration member from a suitable koro member and a suitable plate, or a block object, it does not interfere at all.

[0083] Moreover, as long as such the arrangement number of the second migration member does not necessarily have to be made into plurality, either and can clamp the second conclusion object certainly between the first conclusion object, you may make it arrange only one.

[0084] furthermore -- said operation gestalt -- the second migration -- a member -- although two or more steel balls 70 are arranged in the breakthrough 68 prepared in the large piston 16 which constitutes the first migration member and project/move [level-luffing-motion] out of this breakthrough 68, it is [place / needless to say] that it is not that by which the second arrangement location and migration structure of a migration member are also limited to especially this .

[0085] Moreover, although the first migration member was constituted from said operation gestalt by the small piston 18 which performs engagement actuation to the second conclusion object 12 of the second steel ball 70 of migration member slack plurality, and the large piston 16 at which the first and second clamp actuation of the conclusion objects 10 and 12 is made to perform Even if constituted from one member which performs both these two actuation of this first migration member, it does not interfere at all.

[0086] Furthermore, when it constitutes from a small piston 18 and a large piston 16, even if it is, the first migration member The migration structure to the vertical direction (the opposite direction of two members which should be concluded) of these smallness and the large pistons 18 and 16 is not what is especially limited to what is shown in said operation gestalt. For example, it adds to two oil pressure rooms on which the oil pressure to which smallness and the large pistons 18 and 16 are moved up, respectively is made to act. It is also possible to prepare further two oil pressure rooms on which the oil pressure to which they are moved caudad, respectively is made to act, and to make it move smallness and the large pistons 18 and 16 to up down one with those oil pressure, respectively.

[0087] Furthermore, although the projection section was constituted from the sleeve 57 extrapolated by the shank 34 of the large piston 16 which constitutes the first migration member by said operation gestalt again This projection section has the contact side which counters the second conclusion object in the opposite direction of two members which should be concluded, and by migration in this opposite direction of the first migration member If it is constituted so that the second conclusion object can be projected in this opposite direction, the arrangement structure over the first migration member will not be what is limited in any way. the second conclusion object is contacted in an applicable plane of composition -- making -- this -- therefore, said large piston 16 -- the opposite direction with the second conclusion object -- receiving -- a right-angled direction -- going -- a predetermined height projection -- this -- an opposed face with the second conclusion object may form in one the heights made into the contact side, and may constitute these heights as the projection section.

[0088] Moreover, although the contact side 61 of the sleeve 57 as the projection section is made to contact the contact surface 96 of the engagement projected part 92 of the second conclusion object 12 and the second conclusion object 12 is projected in this engagement projected part 92 with said operation gestalt the part to which the contact sides of the projection section differ in the contact surface 96 of the engagement projected part 92 to the second conclusion object 12 is made to contact -- having -- this -- even if the second

conclusion object 12 constitutes in this contact part so that it may project in the projection section, it does not interfere at all.

[0089] furthermore , it be never limit to what be show in said operation gestalt , and as long as it obtain , they be in the condition which be make to move in the opposite direction of two member slack fixture plates 11 and base elements 13 which should be conclude and which arranged the small piston 18 and the large piston 16 perpendicularly , or arranged them horizontally , and may also arrange the arrangement structure of the small piston 18 and the large piston 16 .

[0090] Furthermore, although the second conclusion object 12 is made to extrapolate to the first conclusion object 10 and is made to fit in in the vertical direction with said operation gestalt again By preparing a predetermined fitting hole in the first conclusion object, and inserting the second conclusion object in it in this fitting hole It is changed according to the opposite direction of two members where it is also possible in which to accomplish so that the first conclusion object and the second conclusion object may be fitted in, and the direction of fitting of the conclusion object of them first and the second conclusion object should be concluded. In addition, toward the inside of a fitting hole, when adopting the fitting structure which inserts in the second conclusion object and fits in in the fitting hole of the first conclusion object, the second migration member will be constituted so that it may be made to move to a way among the first conclusion object.

[0091] In addition, although are applied to the fastener used in order to conclude mutually the base element and fixture plate in which this invention is attached by the table of machine tools, such as a machining center, and the example was shown with said operation gestalt Of course, it is what may be advantageously applied also to the fastener used in order that this invention may conclude mutually two various members which should be concluded.

[0092] In addition, although listing is not carried out one by one, unless this invention may be carried out in the mode which added modification which becomes various based on this contractor's information, correction, amelioration, etc. and such an embodiment deviates from the meaning of this invention, it is a place needless to say that it is that by which all are contained within the limits of this invention.

[0093]

[Effect of the Invention] Securing effectively the smooth operability of conclusion of two members which should be concluded, and its discharge according to the fastener according to this invention so that clearly also from the above explanation, the precision of the conclusion location of these two members may be raised much more advantageous, and the always stabilized location precision may be secured very effectively.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the longitudinal-section explanatory view showing an example of a fastener according to this invention.

[Drawing 2] It is the explanatory view showing the busy condition of the fastener shown in drawing 1 , and the condition of having made two or more steel balls which could project on the first conclusion object from the first conclusion object, and were closed on it under the condition of having made the second conclusion object fitting in engaging with the engagement projected part of the second conclusion object is shown.

[Drawing 3] It is the explanatory view showing another busy condition of the fastener shown in drawing 1 , and the engagement projected part of the second conclusion object is clamped between the cylinder part material of the first conclusion object with the lobe from the first conclusion object of two or more steel balls, and the condition of having made the base element and fixture plate with which the first and second conclusion objects were fixed, respectively conclude mutually is shown.

[Drawing 4] It is the explanatory view showing still more nearly another busy condition of the fastener shown in drawing 1 , and the condition of having canceled the engagement to the engagement projected part of two or more steel balls is shown from the conclusion condition of a base element and a fixture plate.

[Drawing 5] In the bottom of the condition of which it is the explanatory view showing other busy conditions of the fastener shown in drawing 1 , and the engagement to the engagement projected part of two or more steel balls was canceled By migration to the upper part of the large piston in the first conclusion object, the second conclusion object is projected up at this large piston with the sleeve by which extrapolation immobilization was carried out, and the condition of having broken off its relationship the fitting condition of the first conclusion object and the second conclusion object is shown.

[Description of Notations]

10 First Conclusion Object 11 Fixture Plate
 12 First Conclusion Object 13 Base Element
 14 Cylinder Part Material 16 Large Piston
 18 Small Piston 30 Cylindrical Projection
 31 95 Fitting side 36 Large oil pressure room
 57 Sleeve 61 Contact Side
 64 Disk Spring 68 Through Tube
 70 Steel Ball 78 Smallness Oil Pressure Room
 86 Compression Coil Spring 90 Press Side
 92 Engagement Projected Part 93 Crevice
 94 Engagement Side 96 Contact Surface

[Translation done.]

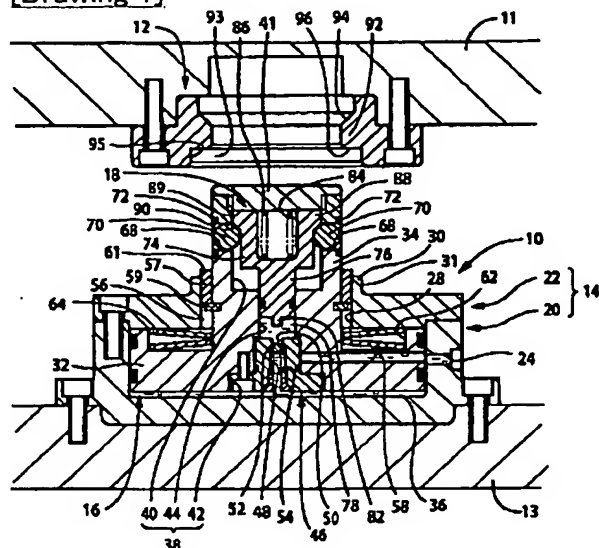
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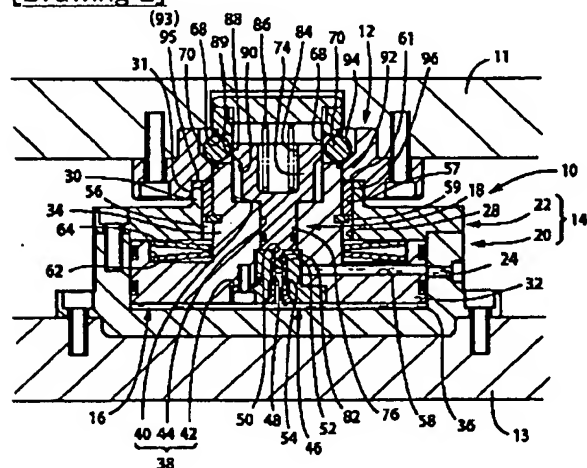
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DRAWINGS

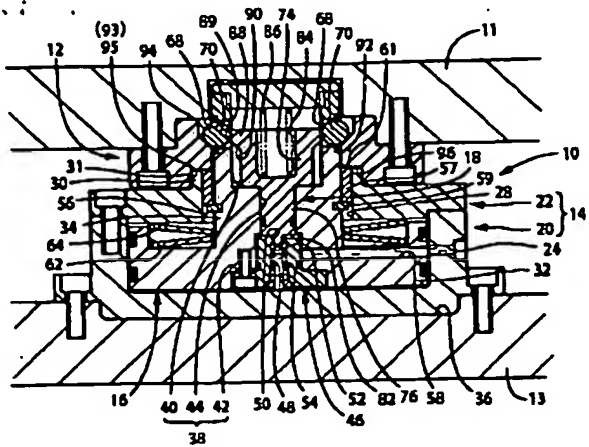
[Drawing 1]



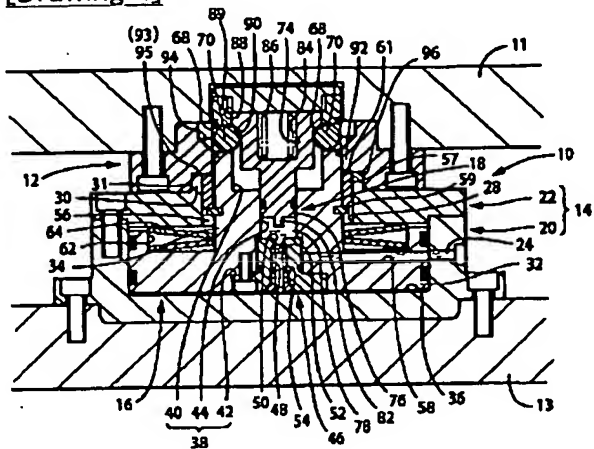
[Drawing 2]



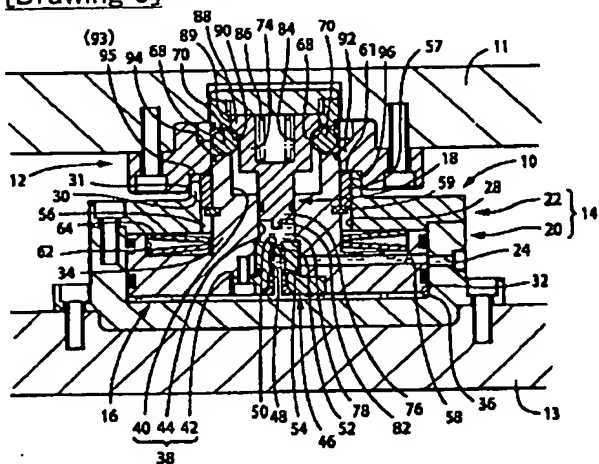
[Drawing 3]



[Drawing 4]



[Drawing 5]



[Translation done.]

【特許請求の範囲】

【請求項 1】 締結されるべき二つの部材の対向面側にそれぞれ別個に位置固定に設けられた、該二つの部材の対向方向に延びるそれぞれの嵌合面において互いに嵌合可能な第一及び第二の締結体を有すると共に、該第一の締結体を、該対向方向に移動せしめられる第一の移動部材と、該対向方向に対して直角な方向に移動せしめられて、該第一の締結体から突出／引込み移動せしめられる第二の移動部材とを含んで構成する一方、前記第二の締結体に対して、前記第一の締結体における第二の移動部材の突出状態下において、該第二の移動部材に係合可能な係合部を設け、該第一の締結体と該第二の締結体とを前記対向方向に接近移動させて前記嵌合面において嵌合せしめた状態下で、前記第一の移動部材の前記対向方向における移動によって、前記第二の移動部材を該第一の締結体から突出させて、該第二の移動部材を前記第二の締結体の係合部に係合せしめることにより、それら第一及び第二の締結体のクランプを行い、前記二つの部材を相互に締結するようにした締結装置において、

前記第一の締結体における前記第一の移動部材に、前記対向方向において前記第二の締結体に対向する当接面を有する突出し部を設けて、該第一の移動部材の該対向方向における移動により、該突出し部の当接面を前記第二の締結体に当接させ、該第二の締結体を該対向方向に突き出し得るように構成したことを特徴とする締結装置。

【請求項 2】 前記第一の締結体と前記第二の締結体のうちの何れか一方の締結体に、該一方の締結体の前記嵌合面を与える凸部又は凹部が設けられている一方、それらの中の何れか他方の締結体に、該一方の締結体に設けられた凸部又は凹部に対応した、該他方の締結体の前記嵌合面を与える凹部又は凸部が設けられ、該第一の締結体と該第二の締結体とが、それらにそれぞれ設けられた凸部と凹部にて、いろう嵌合せしめられるように構成されている請求項 1 に記載の締結装置。

【請求項 3】 前記第一の移動部材における前記突出し部が、前記第二の締結体における前記係合部に対して前記対向方向に対向する前記当接面を有して構成され、前記第一の移動部材の該対向方向における移動により、前記突出し部の当接面が、該係合部に当接せしめられて、該第二の締結体が、該対向方向に突き出され得ようになっている請求項 1 又は請求項 2 に記載の締結装置。

【請求項 4】 前記第一の締結体における前記第一の移動部材に、前記対向方向に延びる延出部が設けられて、前記第二の締結体が、かかる延出部に外押されることにより、該第二の締結体と前記第一の締結体とが、前記それぞれの嵌合面において互いに嵌合せしめられるように構成される一方、前記突出し部が、該第一の移動部材の前記延出部に、外押された状態で固定されるスリーブにて構成されている請求項 1 乃至請求項 3 の何れかに記載の締結装置。

【発明の詳細な説明】

【0001】

【技術分野】本発明は、所定の二つの部材を迅速に且つ容易に締結し得る締結装置に係り、特に、マシニングセンタ等の工作機械テーブルに取り付けられるベースエレメントと所定の治具が固定される治具プレートとを相互に締結するのに好適に用いられ得る締結装置に関するものである。

【0002】

【背景技術】従来より、二つの部材を締結するための締結装置としては、種々の構造のものがあり、それらの中から、締結されるべき部材の形状や用途等に応じて、適宜に選択されて、使用されている。そして、その中の一つとして、マシニングセンタ等の工作機械において、加工されるべきワークを保持するクランプやバイス等の各種の治具が固定された治具プレートをベースエレメントに対して締結させる際に使用される締結装置がある。

【0003】ところで、かかる治具プレートをベースエレメントに締結させるための締結装置にあっても、様々な構造のものが提案されており、中でも、以下に示す如き構造の締結装置が、治具プレートとベースエレメントの締結時における操作性に優れたものとして、知られている。

【0004】すなわち、この締結装置は、互いに対向配置されるベースエレメントと治具プレートとに対してそれぞれ位置固定に設けられ、それらベースエレメントと治具プレートの対向方向に延びるそれぞれの嵌合面において互いに嵌合可能に構成された第一の締結体と第二の締結体とを有している。また、第一の締結体は、例えば、油圧やばね力等の作用により、ベースエレメントと治具プレートとの対向方向に移動せしめられる第一の移動部材と、この第一の移動部材の該対向方向への移動に伴って、カム機構等により、該対向方向に対して直角な方向に移動せしめられて、第一の締結体から突出／引込み移動せしめられる第二の移動部材とを含んで、構成されている。一方、第二の締結体は、かかる第一の締結体における第二の移動部材の突出状態下で、該第二の移動部材に係合可能な係合部を有して、構成されている。そして、このような構成の締結装置では、第一の締結体と第二の締結体とを前記対向方向に接近移動させて、それぞれの嵌合面において嵌合せしめた状態下で、第一の移動部材を前記対向方向に移動させることにより、第二の移動部材を第一の締結体から突出せしめて、第二の締結体における前記係合部に係合させることによって、それら第一及び第二の締結体のクランプを行い、以て、第一及び第二の締結体の固定されたベースエレメントと治具プレートとを相互に締結し得るようになっているのである。

【0005】従って、かくの如き構造とされた従来の締結装置においては、単に、第一の移動部材を前記対向方

向に移動させるだけで、ベースエレメントと治具プレートの締結が容易に且つ迅速に行われ得、それにより、それらベースエレメントと治具プレートの締結時において、優れた操作性が発揮され得るのであるが、その一方で、以下に示す如き問題が内在するものであったのである。

【0006】つまり、かかる従来の締結装置にあっては、治具プレートとベースエレメントの締結位置の精度を高めるべく、多くの場合、第一の締結体と第二の締結体に、それぞれ、互いに対応する凸部や凹部を設けて、第一及び第二の締結体を、それら凸部と凹部のそれぞれの嵌合面において、互いに入れ合う嵌合せしめることにより、第一の締結体と第二の締結体の嵌合状態において、それら第一及び第二の締結体が、前記対向方向に対して直角な方向に位置ずれを起こすようなことが可及的に防止されるようになっている。しかしながら、そのような入れ合う嵌合の公差を余りに厳しくすると、つまり、凸部と凹部の嵌合面間に設けられるクリアランスが余りに小さいと、それら凸部と凹部のそれぞれの嵌合面同士が密接せしめられて、第一及び第二の締結体の嵌合状態が容易に解除され得なくなり、それによって、第一及び第二の締結体によるベースエレメントと治具プレートの締結を解除せしめる際におけるスムーズな操作性が大きく損なわれることになるところから、かかるクリアランスが、凸部と凹部のそれぞれの嵌合面同士が密接せしめられない程度の、所謂「遊び」をもった大きさとされていた。そのため、従来の締結装置では、かかる「遊び」の分だけ、第一の締結体と第二の締結体とが、ベースエレメントと治具プレートの対向方向に対して直角な方向に位置ずれを起こすことが避けられなかったのである。

【0007】それ故、かくの如き従来の締結装置においては、ベースエレメントと治具プレートの締結状態の解除時における操作性が有利に確保され得るものの、それらベースエレメントと治具プレートの締結位置について、より高い精度が求められても、その要求を十分に満足せしめることが出来なかったのである。

【0008】

【解決課題】ここにおいて、本発明は、上述せる如き事情を背景にして為されたものであって、その解決課題とするところは、締結されるべき二つの部材のそれぞれに対して位置固定に設けられる第一の締結体と第二の締結体とを有し、それら第一の締結体と第二の締結体とを互いに嵌合させた状態で、第一及び第二の締結体のクランプを行うことによって、前記二つの部材を相互に締結するようにした締結装置において、第一の締結体と第二の締結体とがそれぞれの嵌合面において互いに密接せしめられた嵌合状態が、容易に且つ迅速に解除され得るようになすことにより、締結されるべき二つの部材の締結及びその解除のスムーズな操作性を有効に確保しつつ、

それら二つの部材の締結位置の精度をより一層高められ得るようにした締結装置の新規な構造を提供することにある。

【0009】

【解決手段】そして、本発明にあっては、かかる課題の解決のために、締結されるべき二つの部材の対向面側にそれぞれ別個に位置固定に設けられた、該二つの部材の対向方向に延びるそれぞれの嵌合面において互いに嵌合可能な第一及び第二の締結体を有すると共に、該第一の締結体を、該対向方向に移動せしめられる第一の移動部材と、該対向方向に対して直角な方向に移動せしめられて、該第一の締結体から突出／引込み移動せしめられる第二の移動部材とを含んで構成する一方、前記第二の締結体に対して、前記第一の締結体における第二の移動部材の突出状態下において、該第二の移動部材に係合可能な係合部を設け、該第一の締結体と該第二の締結体とを前記対向方向に接近移動させて前記嵌合面において嵌合せしめた状態で、前記第一の移動部材の前記対向方向における移動によって、前記第二の移動部材を該第一の締結体から突出させて、該第二の移動部材を前記第二の締結体の係合部に係合せしめることにより、それら第一及び第二の締結体のクランプを行い、前記二つの部材を相互に締結するようにした締結装置において、前記第一の締結体における前記第一の移動部材に、前記対向方向において前記第二の締結体に対向する当接面を有する突出し部を設けて、該第一の移動部材の該対向方向における移動により、該突出し部の当接面を前記第二の締結体に当接させ、該第二の締結体を該対向方向に突き出し得るように構成したことを特徴とする締結装置を、その要旨とするものである。

【0010】すなわち、このような本発明に従う締結装置にあっては、第一の締結体と第二の締結体との嵌合状態下で、単に、該第一の締結体における第一の移動部材を、締結されるべき二つの部材の対向方向に移動させるだけで、第二の移動部材が第一の締結体から突出させられて、第二の締結体の係合部に係合せしめられ、それによって、第一の締結体と第二の締結体のクランプが行われて、締結されるべき二つの部材が締結されるようになっているところから、それら二つの部材を締結せしめる際において、従来装置と同様に、極めて優れた操作性が有利に発揮され得るのである。

【0011】そして、かかる締結装置においては、特に、そのような第一の締結体と第二の締結体との締結状態下で、第一の移動部材を、前記対向方向において、該第一の移動部材に設けられた突出し部の当接面が第二の締結体に当接せしめられる方向に、つまり、第一の締結体側から第二の締結体側に向かう方向に移動させることにより、第二の締結体が、該第一の移動部材の突出し部にて、該対向方向に突き出され得るようになっているところから、例えば、第一及び第二の締結体の嵌合い公差

を厳しくすることにより、それぞれの嵌合面同士の間
のクリアランスが「遊び」のない大きさとされて、それら
各嵌合面同士が互いに密接せしめられた状態において、
第一の締結体と第二の締結体が嵌合せしめられるよう
になっていても、第一の移動部材を前記対向方向に移動せ
しめて、突出し部により第二の移動部材を突き出すとい
った、前記二つの部材を締結する際と同様な簡単な操作
を行うだけで、嵌合状態の第一の締結体と第二の締結体
とが容易に縁切りされ得て、それら第一及び第二の締結
体の嵌合状態が確実に且つ容易に解除され得るのである。

【0012】それ故、この本発明に従う締結装置にあっ
ては、従来装置とは異なって、締結せしめられた前記二
つの部材を解除せしめる際におけるスムーズな操作性を
損ねることなく、第一の締結体と第二の締結体の嵌合い
公差をより厳しくすることが可能となつて、第一及び第
二の締結体のそれぞれの嵌合面同士の間に「遊び」をも
ったクリアランスを設ける必要が効果的に皆無ならしめ
られ得、それにより、第一の締結体と第二の締結体の嵌
合状態下において、かかる「遊び」の分だけ、それら第
一及び第二の締結体が、前記対向方向に対して直角な方
向に位置ずれを起こすようなことも有利に解消され得る
のである。

【0013】従つて、このような本発明に従う締結装置
にあっては、締結されるべき二つの部材の締結及びその
解除のスムーズな操作性を有効に確保しつつ、それら二
つの部材の締結位置の精度がより一層有利に高められ得
て、常に安定した位置精度が、極めて効果的に確保され
得ることとなるのである。

【0014】なお、かかる本発明に従う締結装置の好ま
しい態様の一つによれば、前記第一の締結体と前記第二
の締結体のうちの何れか一方の締結体に、該一方の締結
体の前記嵌合面を与える凸部又は凹部が設けられている
一方、それらのうちの何れか他方の締結体に、該一方の
締結体に設けられた凸部又は凹部に対応した、該他方の
締結体の前記嵌合面を与える凹部又は凸部が設けられ、
該第一の締結体と該第二の締結体とが、それらにそれぞ
れ設けられた凸部と凹部にて、いんろう嵌合せしめられ
るように構成されることとなる。

【0015】このような構成を採用すれば、例えば、互
いにいんろう嵌合せしめられる凸部と凹部のそれぞれの
嵌合面同士の間クリアランスを「遊び」のない大きさと
とすることによって、第一及び第二の締結体が前記対向
方向に対して直角な方向に位置ずれを起こすようなこと
が、更に一層確実に阻止され得て、締結されるべき二つ
の部材の締結位置の精度が、より一層効果的に高められ
得るのである。

【0016】また、本発明に従う締結装置の有利な態様
の一つによれば、前記第一の移動部材における前記突出
し部が、前記第二の締結体における前記係合部に対して

前記対向方向に対向する前記当接面を有して構成され、
前記第一の移動部材の該対向方向における移動により、
前記突出し部の当接面が、該係合部に当接せしめられ
て、該第二の締結体が、該対向方向に突き出され得るよ
うに構成される。

【0017】このような構成を有する締結装置にあって
は、第一の移動部材の突出し部にて突き出される第二の
締結体の被突出し部位が、第一の移動部材の移動により
第一の締結体から突出移動せしめられる第二の移動部材
に係合する第二の締結体の係合部にて構成されているた
め、かかる被突出し部位を第二の締結体に対して特別に
設ける必要がなく、その分だけ、第二の締結体、ひいて
は装置全体の構造が、有利に簡略化され得るのである。

【0018】さらに、本発明に従う締結装置の望ましい
態様の一つによれば、前記第一の締結体における前記第
一の移動部材に、前記対向方向に延びる延出部が設けら
れて、前記第二の締結体が、かかる延出部に外挿される
ことにより、該第二の締結体と前記第一の締結体とが、
前記それぞれの嵌合面において互いに嵌合せしめられる
ように構成される一方、前記突出し部が、該第一の移動
部材の前記延出部に、外挿された状態で固定されるスリ
ープにて構成される。

【0019】かかる構成を有する締結装置にあっては、
第二の締結体が、第一の締結体における第一の移動部材
の延出部に外挿されることにより、第一の締結体と第二
の締結体とが互いに嵌合せしめられるようになっている
ところから、第一の移動部材の延出部に対する第二の締
結体の外挿操作により、第一締結体と第二の締結体のそ
れぞれの嵌合面が互いに対応するように、容易に位置決
めされ得、それによって、それら第一及び第二の締結体
の嵌合操作が、より確実に且つスムーズに行われ得るの
である。また、第一の移動部材の突出し部が、そのよう
な第一の移動部材の延出部に外挿された状態で固定され
る、該延出部とは別体のスリーブにて構成されていると
ころから、突出し部が第一の移動部材に対して一体成形
されている場合とは異なって、第一の移動部材に対する
突出し部の配設位置や、その大きさ及び形状等が、第一
の移動部材の設計とは独立して決定され得るのであり、
それによって、第一の移動部材、ひいては装置全体の設
計自由度が、効果的に広げられ得るといった利点が得ら
れることとなるのである。

【0020】また、本発明に従う締結装置の好ましい別
の態様の一つによれば、前記第一の移動部材が、第一及
び第二の付勢手段のそれぞれの付勢力により、前記対向
方向の一方側に移動せしめられ、且つ油圧により、該第
一及び第二の付勢手段による移動方向とは反対側方向に
移動せしめられる第一及び第二のピストン部材にて構成
されると共に、前記第二の移動部材が、該第一のピスト
ン部材の該第一の付勢手段による移動方向への移動によ
り、該対向方向に対して直角な方向に移動せしめられ

て、前記第一の締結体から突出せしめられるように構成され、該第一の締結体と前記第二の締結体とを前記嵌合面において嵌合せしめた状態で、該第一のピストン部材を前記第一の付勢手段の付勢力による移動方向に移動せしめて、前記第二の移動部材を該第一の締結体から突出せしめることにより、該第二の移動部材を前記第二の締結体の係合部に係合せしめる一方、前記第二のピストン部材を前記第二の付勢手段の付勢力による移動方向に移動せしめることにより、該第二の締結体の係合部に係合せしめられた該第二の移動部材を該第二のピストン部材にて押圧して、前記第一及び第二の締結体のクランプを行うように構成されることとなる。

【0021】このような構成を有する締結装置にあっては、第一の移動部材を構成する第一及び第二のピストン部材に対して、所定の油圧を作用せしめたり、また、その油圧を解除したりするだけで、第一及び第二の締結体のクランプ及びアンクランプを、より容易に且つ迅速に行うことが出来るのである。

【0022】また、かかる締結装置においては、第二の移動部材を突出移動せしめて、第二の締結体の係合部に係合させる第一のピストン部材の移動ストロークを、第二の移動部材が確実に突出移動せしめられ得るように十分に大きく設定しつつ、その圧力受容面の面積を小さく為す一方、係合部に係合せしめられた第二の移動部材を押圧することにより、第一及び第二の締結体のクランプを行う第二のピストン部材の圧力受容面の面積を、より大きな油圧が及ぼされ得るように比較的に大きく設定しつつ、その移動ストロークを小さく為すことが出来、それによって、第一の移動部材を、大きな移動ストロークと大きな圧力受容面の面積とを有する一つのピストン部材にて構成する場合に比して、ピストン部材を付勢手段の付勢力に抗して前記対向方向に移動させるのに必要な圧油の量を、有利に少なく抑えることが可能となるのである。そして、その結果、圧油を大量に吐出する大型の油圧ポンプ等を用いることなく、比較的に小型で、経済的な油圧ポンプを用いた、少ない量の圧油の装置内への供給及びその排出によって、第一及び第二の締結体のクランプ操作及びアンクランプ操作を行うことが出来るのである。

【0023】従って、かくの如き構成の締結装置にあっては、締結されるべき二つの部材の締結及びその解除を、より容易に且つ迅速に行うことが出来るばかりでなく、その作業コストを効果的に低く抑えることも可能となるのである。

【0024】なお、そのように、第一の移動部材を第一のピストン部材と第二のピストン部材にて構成すると共に、それら第一及び第二のピストン部材を、上述の如き構造にて前記対向方向に移動せしめられるように為す場合には、有利には、前記第二のピストン部材の軸部に、前記第一のピストン部材に対して及ぼされる前記油圧を

圧油の導入により生ぜしめる第一の油圧室を与える、軸方向に延びる挿通穴からなるシリンダ部が設けられて、かかる第二のピストン部材のシリンダ部内に、該第一のピストン部材が、前記第一の付勢手段の付勢力により、前記対向方向一方側に移動せしめられ、且つ該第一の油圧室内に作用せしめられる油圧により、該第一の付勢手段による移動方向とは反対側方向に移動せしめられるように配置される一方、前記第一の締結体が、前記第二のピストン部材に対して及ぼされる前記油圧を圧油の導入により作用せしめる第二の油圧室を与えるシリンダ部材を更に有して構成されて、かかるシリンダ部材内に、該第二のピストン部材が、前記第二の付勢手段の付勢力により、前記対向方向一方側に移動せしめられ、且つ該第二の油圧室内に作用せしめられる油圧により、該第二の付勢手段による移動方向とは反対側方向に移動せしめられるように配置されることとなる。

【0025】このような構成を採用すれば、第二のピストン部材が、所定のシリンダ部材内に配設された状態で、第一のピストン部材が、該第二のピストン部材の軸部に設けられたシリンダ部内において、同軸的に配設されることになるため、それら第一のピストン部材と第二のピストン部材とが、左右方向や上下方向に離間して配設される場合に比して、装置全体の大きさが小型化され、比較的にコンパクトに構成され得るのである。

【0026】また、そのような第一及び第二のピストンの配設状態下では、好ましくは、前記第二のピストン部材における前記軸部の少なくとも一部が、前記シリンダ部材から外方に突出せしめられると共に、かかる軸部の突出部位における前記シリンダ部の側壁に、前記軸方向に対して直角な方向において該側壁を貫通して延びる貫通孔が形成され、更に、かかる貫通孔内に、前記第二の移動部材が、該貫通孔の延びる方向に移動可能に配置され、該シリンダ部内での前記第一のピストン部材の前記第一の付勢手段による移動方向への移動により、かかる第二の移動部材が、該貫通孔内をそれが延びる方向に移動せしめられて、該貫通孔の開口部から突出せしめられることにより、前記第一の締結体から突出せしめられるように構成される。

【0027】かくの如き構成によれば、第二の移動部材が、第二のピストン部材におけるシリンダ部の貫通孔内に配置されて、かかる貫通孔を通じて、第一のピストン部材の軸方向に対して直角な方向に突出／引込み移動せしめられるように構成されることになるところから、第二の移動部材の配設スペースを第一及び第二のピストン部材の配設スペースとは別に設ける必要がなく、それによって、装置全体の小型、コンパクト化が、より有効に図られ得るのである。

【0028】さらに、かかる第二の移動部材の配設構造が採用される場合において、望ましくは、前記第二の締結体が、前記第二のピストン部材における前記軸部の前

記シリンダ部材からの突出部位に外挿されることにより、該第二の締結体と前記第一の締結体とが、前記それぞれの嵌合面において互いに嵌合せしめられると共に、前記第二の移動部材が、前記第一のピストン部材の前記第一の付勢手段による移動方向への移動により、前記貫通孔の開口部から外方に突出せしめられるように構成される一方、前記第二の締結体における前記係合部が、該第二のピストン部材の前記突出部位に対する該第二の締結体の外挿部位に、前記対向方向に対して直角な方向において内方に突出して設けられ、更に、前記突出し部

が、該係合部に対して該対向方向に対向する前記当接面を有して、該第二のピストン部材に設けられ、該第二のピストン部材の該対向方向における移動により、前記突出し部の当接面が、該係合部に当接せしめられて、該第二の締結体が、該対向方向に突き出され得るように構成される。

【0029】このような構成を有する締結装置にあっては、単に、第二の締結体を第二のピストン部材の突出部位に外挿するだけで、第一締結体と第二の締結体のそれぞれの嵌合面が互に対応するように、容易に位置決め

【0030】

【発明の実施の形態】以下、本発明を更に具体的に明らかにするために、本発明に係る締結装置の具体的な構成について、図面を参照しつつ、詳細に説明することとする。

【0031】先ず、図1には、本発明に従う構造を有し、マシニングセンタ等の工作機械のテーブルに取り付けられるベースエレメントと治具プレートとを相互に締結するために用いられる締結装置の一例が、概略的に示されている。かかる図1からも明らかなように、締結装置は、第一の締結体10と第二の締結体12とを有して構成されており、第一の締結体10が、上下方向に対向配置された治具プレート11とベースエレメント13のうち、下方に位置するベースエレメント13に対して位置固定に設けられ、また、第二の締結体12が、上方に位置する治具プレート11に対して位置固定に設けられるようになっている。そして、それら第一の締結体10と第二の締結体12とを、上下方向においていんろう嵌合せしめた状態で、それら治具プレート11とベースエレメント13とを締結し得るように構成されているのである。

【0032】具体的には、かかる締結装置を構成する第一の締結体10は、ベースエレメント13に固定されるシリンダ部材14と、該シリンダ部材14内において、軸方向に上下移動可能に配置された、第二のピストン部材としての大ピストン16と、該大ピストン16の内部において、軸方向に上下移動可能に配置された、第一のピストン部材としての小ピストン18とを、更に含んで成っている。

【0033】また、シリンダ部材14は、上方に向かって開口する浅底の略円筒形状を呈するバレル部20と、厚肉の略円板形状を呈するヘッド部22とを有している。そして、このシリンダ部材14のヘッド部22には、その中央部に、円形の中心孔28が、該中央部を貫通して設けられており、また、かかる中心孔28の開口縁部には、中心孔28と同一内径を有する円筒状突起30が、該開口縁部から所定高さをもって鉛直上方に延び出すようにして、一体的に立設されている。なお、この円筒状突起30は、前記第二の締結体12がいんろう嵌合せしめられる際において、該第二の締結体12に設けられる凹部に嵌入する凸部として形成されており、その外周面が、締結されるべき前記治具プレート11と前記ベースエレメント13との対向方向たる上下方向（鉛直方向）に向かって延びる、第一の締結体側嵌合面31とされている。

【0034】そして、そのようなヘッド部22が、バレル部20に対して、その上部開口部を覆蓋して、ボルト固定されていると共に、バレル部20が、その外周面に対して水平方向に突設された複数のフランジ突起に配設される取付ボルトにて、ベースエレメント13の上面に固定されており、以てシリンダ部材14が、中心孔28において上方に開口する、中空の略円柱形状をもって構成されていると共に、ベースエレメント13の上面に対して、位置固定に設けられているのである。また、かかるシリンダ部材14においては、バレル部20の筒壁部に、それを厚さ方向に貫通する流油孔24が設けられおり、この流油孔24が、図示しない油圧ポンプ等に接続されることによって、圧油が、シリンダ部材14内に供給されるようになっている。

【0035】一方、大ピストン16は、全体として、下部部位が大径化された、縦断面逆T字状の略段付円柱形状を呈しており、T字の頭部に相当する下部部位が、シリンダ部材14におけるバレル部20の内径よりも僅かに小さな外径を有する摺動部32とされている一方、T字の脚部に相当する上部部位が、シリンダ部材14におけるヘッド部22の中心孔28の開口径よりも十分に小さな外径を有する軸部34とされている。そして、そのような大ピストン16が、摺動部32をシリンダ部材14のバレル部20内に収容せしめ、且つ該シリンダ部材14のヘッド部22の中心孔28を通じて、軸部34の上部部位を上方に突出せしめた状態で、摺動部32の外

周面において、バレル部20の内周面に摺動しつつ、軸方向において上下に移動せしめられ得るようにして、シリンダ部材14内に配置されている。また、そのような大ピストン16のシリンダ部材14内への配置状態で、該大ピストン16の上方への移動によって、摺動部32の下面とシリンダ部材14の内面に囲まれてなる空間が、前記流油孔24を通じてシリンダ部材14（バレル部20）内に供給される圧油が導入せしめられる第二の油圧室としての大油圧室36とされているのである。

【0036】また、シリンダ部材14内に配置された大ピストン16の中心部には、軸部34と摺動部32とを軸方向に貫通して延びる挿通孔38が形成されている。この挿通孔38は、軸部側開口部40と摺動部側開口部42とを接続する接続部44が、両開口部40、42よりも所定寸法小径化された段付きの円形孔から成っている。そして、そのような挿通孔38にあっては、軸部側開口部40の上部内周面に設けられたねじ部に、蓋体41が螺合されている一方、摺動部32を貫通する部位、つまり摺動部側開口部42とそれに連続する接続部44の一部分とを含む挿通孔38の下部部位に、かかる部位の内側形状よりも一周り小さな類似形状を呈する閉塞金具46が、同軸的に嵌入されて、ボルト固定されており、以て、それら蓋体41と閉塞金具46とにて、挿通孔38の上側及び下側開口が、それぞれ閉塞せしめられている。

【0037】また、挿通孔38の下部部位に配設されて、その下側開口を閉塞する閉塞金具46は、その中心部を上下方向に貫通する貫通孔48を有している。更に、この閉塞金具46の貫通孔48は、その上部開口部が、所定寸法細小化されてなる狭窄開口部50とされており、下部開口部側に、その内径よりも十分に小さく、且つ狭窄開口部50の開口径よりも大きな径を有するボール弁52が、上下方向に移動可能に収容されていると共に、このボール弁52を上方に付勢する圧縮コイルばね54が、配設されている。そして、かかるボール弁52に対して、圧縮コイルばね54の付勢力よりも大きな外力が加わらない限りは、閉塞金具46の貫通孔48における狭窄開口部50が、ボール弁52にて、液密に閉塞せしめられる一方、ボール弁52に対して、圧縮コイルばね54の付勢力よりも大きな外力が加えられた際には、ボール弁52が圧縮コイルばね54の付勢力に抗して下方に移動せしめられて、ボール弁52による狭窄開口部50の閉塞が解消され、以て狭窄開口部50が、前記挿通孔38の接続部44内に向かって開口せしめられて、挿通孔38が、下方に向かって開口せしめられるようになっているのである。

【0038】さらに、かくの如き閉塞金具46が配設される挿通孔38の下部部位と与える大ピストン16の摺動部32には、前記シリンダ部材14のバレル部20における流油孔24と該挿通孔38の下部部位とを連通せ

しめる流油路58が形成されており、該流油孔24からバレル部20内に供給された圧油が、この流油路58を通じて、該挿通孔38内に導かれるようになっている。これにより、前述の如くして、前記閉塞金具46の狭窄開口部50のボール弁52による閉塞が解消された場合に限って、挿通孔42内に導かれた圧油が、該閉塞金具46の貫通孔48を通過して、前記大油圧室36内に供給されるようになっているのである。

【0039】また、大ピストン16の摺動部32の上面には、浅底の円形溝62が、軸部34を取り囲むように形成されており、更に、この円形溝62内には、第一の付勢手段としての皿ばね64が、それぞれの中心部に設けられた円形孔において、大ピストン16の軸部34に外挿せしめられた状態で、該大ピストン16を下方に向かって付勢するように、収容、配置されている。

【0040】かくして、シリンダ部材14内において上下移動可能に配置された大ピストン16が、皿ばね64の付勢力により下方に移動せしめられるようになっている一方、そのような下方への移動状態で、流油孔24と流油路58とを通過して挿通孔38内に導入された圧油が、閉塞金具46の貫通孔48を経て、大油圧室36内に供給されて、該大油圧室36内に油圧が作用せしめられることにより、皿ばね64の付勢力に抗して上方に移動せしめられるようになっているのである。

【0041】なお、ここでは、大ピストン16の圧力受容面が、前記大油圧室36を画成する壁面の一部を構成する大径の摺動部32の下面にて構成されていることによって、かかる大ピストン16の圧力受容面の面積が十分に大きくされており、また、シリンダ部材14内を上下方向に移動せしめられる摺動部32の高さが、該シリンダ部材14内において上下方向に対向するヘッド部22の下面とバレル部20の上面との間の距離よりも僅かに小さくされていることによって、該大ピストン16の移動ストロークが比較的小さくされている。

【0042】一方、小ピストン18は、全体として、上側半分の部位が大径化された略段付円柱形状を呈しており、上側半分の大径部位が、前記挿通孔38における前記軸部側開口部40の内径よりも十分に小さな外径を有する軸部74とされている一方、下側半分の小径部位が、該挿通孔38における前記接続部44の内径よりも僅かに小さな外径を有する摺動部76とされている。そして、このような小ピストン18が、摺動部76の先端部位を挿通孔38の接続部44内に突入せしめた状態で、該摺動部76の外周面において、接続部44の内周面に摺動しつつ、軸方向において上下に移動せしめられ得るようにして、該挿通孔38の軸部側開口部40内に挿通、配置されている。また、この小ピストン18の挿通孔38内での上方への移動によって、摺動部76の下面と閉塞金具46の上面との間に形成される挿通孔38の接続部44内の空間が、挿通孔38の内に導かれた圧

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油が供給される第一の油圧室としての小油圧室 78 とされているのである。

【0043】そして、そのような小ピストン 18 の軸部 74 の中心部には、上方に開口して、軸方向に延びるばね収容穴 84 が設けられており、このばね収容穴 84 内に、第二の付勢手段としての圧縮コイルばね 86 が、小ピストン 18 を下方に向かって付勢する状態で、収容配置されている。

【0044】かくして、大ピストン 16 の挿通孔 38 内において上下移動可能に配置された小ピストン 18 においては、圧縮コイルばね 86 の付勢力により下方に移動せしめられるようになっている一方、そのような下方への移動状態下において、流油孔 24 と流油路 58 とを通じて挿通孔 42 内に導入された圧油が、小油圧室 78 内に供給されて、該小油圧室 78 内に油圧が作用せしめられることにより、圧縮コイルばね 86 の付勢力に抗して、上方に移動せしめられるようになっているのである。

【0045】なお、ここでは、小ピストン 18 の移動ストロークが、前記大ピストン 16 の移動ストロークよりも十分に大きくされており、また、小ピストン 18 の圧力受容面が、挿通孔 38 における小径の接続部 44 内に、小油圧室 78 を画成する壁面の一部を構成する小径の摺動部 76 の下面にて構成されていることによって、該小ピストン 18 の圧力受容面の面積が、大ピストン 16 のそれに比して、十分に小さくされているのである。

【0046】従って、本実施形態においては、大ピストン 16 と小ピストン 18 とが、それぞれ下方への移動端に位置せしめられた状態下で、図示しない油圧ポンプ等に流油孔 24 が接続されて、圧油が、該油圧ポンプから流油孔 24 と流油路 58 とを通じて挿通孔 38 に導かれた際には、先ず、かかる圧油が小油圧室 78 内に供給され、そして、この圧油の供給により小油圧室 78 内に作用せしめられる比較的小さな油圧によって、小ピストン 18 が、前記圧縮コイルばね 86 の下方への付勢力に抗して、大きなストロークをもって上方に移動せしめられるようになっている。

【0047】また、このとき、前記閉塞金具 46 の貫通孔 48 内に配置された圧縮コイルばね 54 は、小油圧室 78 内に圧油が充満するまでは圧縮せしめられないものの、圧油が充満した小油圧室 78 内に、圧油が過剰に供給された際には、該小油圧室 78 内に作用する油圧によって圧縮せしめられるような大きさの付勢力を有して構成されているため、小ピストン 18 が、上方の移動端に達するまでは、閉塞金具 46 の狭窄開口部 50 がボール弁 52 にて閉塞せしめられたままとされて、圧油が大油圧室 36 内に流入することはない（図 4 参照）。

【0048】そして、圧油が小油圧室 78 内に充満せしめられて、小ピストン 18 が上方への移動端に達すると、該小油圧室 78 内における油圧により、閉塞金具 4

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6 の貫通孔 48 内のボール弁 52 が、圧縮コイルばね 54 の付勢力に抗して下方に移動せしめられて、該貫通孔 48 における狭窄開口部 50 のボール弁 52 による閉塞が解除される。これにより、圧油が、該貫通孔 48 を通じて大油圧室 36 内に供給され、また、それに伴って大油圧室 36 内に作用せしめられる大きな油圧により、大ピストン 16 が、二つの皿ばね 64、64 の下方への付勢力に抗して、僅かなストロークで上方に移動せしめられるようになっているのである。そして、大油圧室 36 内に圧油が充満せしめられて、大ピストン 16 が上方への移動端に到達せしめられた状態下で、前記油圧ポンプと流油孔 24 との間のバルブ（図示せず）が閉じられる等して、流油孔 24 が液密に閉塞されると、図 1 に示される如く、狭窄開口部 50 が、ボール弁 52 にて再び閉塞せしめられることとなる。

【0049】一方、かくして、大ピストン 16 と小ピストン 18 とが、それぞれ上方への移動端に位置せしめられた状態下において、油圧ポンプの停止下で前記バルブが開放されて、流油孔 24 の閉塞が解除されると、先ず、小ピストン 18 が、圧縮コイルばね 86 の付勢力により下方に移動せしめられ、それに伴って、小油圧室 78 内の圧油が、流油路 58 を通って、流油孔 24 から外部に排出される（図 2 参照）。そして、小油圧室 78 内の圧油が全て排出されて、小ピストン 18 が下方への移動端に達すると、小ピストン 18 の下面の中心部に設けられた突起 82 が、閉塞金具 46 における狭窄開口部 50 内に突入せしめられることにより、該狭窄開口部 50 のボール弁 52 による閉塞が解除されて、大ピストン 16 が、二つの皿ばね 64、64 の付勢力により下方に移動せしめられ、それに伴って、大油圧室 36 内の圧油が、閉塞金具 46 の貫通孔 48 を通じて小油圧室 78 内に向かって流動せしめられ、更に、流油路 58 と流油孔 24 を通じて外部に排出されるようになっている（図 3 参照）。そして、大油圧室 36 内の圧油が全て排出されると、大ピストン 16 が、下方への移動端に到達せしめられるようになっているのである。

【0050】ところで、このようにして、大及び小ピストン 16、18 が上下方向に移動せしめられるように構成された本実施形態の締結装置では、前述せる如く、シリンダ部材 14 内に配置された大ピストン 16 が、その軸部 34 において、該シリンダ部材 14 におけるヘッド部 22 の中心孔 28 を通じて、上方に突出せしめられているのであるが、この大ピストン 16 の軸部 34 が、かかるヘッド部 22 の中心孔 28 の径よりも十分に小さな外径を有して構成されていることによって、それらヘッド部 22 の中心孔 28 の内周面と、軸部 34 の中心孔 28 内への挿通部位の外周面との間に環状の隙間 56 が形成されている。

【0051】また、大ピストン 16 の軸部 34 において、前記隙間 56 を形成する、ヘッド部 22 の中心孔 2

8内への挿通部位には、該隙間56の幅よりも僅かに小さな厚さの円筒金具からなる、突出し部としてのスリーブ57が、外挿されており、更に、かかるスリーブ57の外挿部位の直下には、ヘッド部22の中心孔28の径よりも小さな外径を有する支持円板59が、その外周部位を、水平方向において、前記隙間56内に突出せしめた状態で、外挿、固定されている。そして、該軸部34に外挿されたスリーブ57が、この支持円板59の外周部位にて支持されることによって、下方への移動が阻止された状態で、大ピストン16の軸部34に取り付けられているのである。また、ここでは、特に、この大ピストン16の軸部34に取り付けられたスリーブ57が、大ピストン16が下方の移動端に位置せしめられたときに、上端面を、ヘッド部22の前記円筒状突起30の上端面と略面一となるように位置せしめ得る高さを有して構成されており、更に、そのようなスリーブ57の上端面が、前記第二の締結体12が第一の締結体10に締結せしめられた際に、該第二の締結体12の、後述する係合突部92の下面(接触面96)に当接する当接面61とされている。

【0052】かくして、本実施形態では、大ピストン16が下方の移動端に位置せしめられた状態から、上方に移動せしめられるのに伴って、スリーブ57の上部部位が、前記隙間56内から上方に突出移動せしめられるようになっており、また、大ピストン16が、そのような上方への移動状態から、下方に移動せしめられるのに伴って、スリーブ57の突出部位が前記隙間56内に引込み移動せしめられ、大ピストン16が、その移動端に位置せしめられることによって、スリーブ57の当接面61が、ヘッド部22の前記円筒状突起30の上端面と略面一に位置せしめられるようになってい

【0053】また、ここにおいて、上述の如きスリーブ57が外挿固定された大ピストン16の軸部34における前記ヘッド部22の中心孔28からの上方向への突出部位には、前記挿通孔38の軸部側開口部40を与える筒壁の同一高さの複数箇所に、水平方向、つまり前記治具プレート11と前記ベースエレメント13との対向方向に対して直角な方向において、該筒壁を貫通して延びる貫通孔68が、それぞれ形成されている。そして、それら各貫通孔68内には、第二の移動部材としてのスチールボール70が、それぞれ一つずつ、各貫通孔68の延出方向たる水平方向に、摺動乃至は転がって移動せしめられ得る状態で、收容配置されている。また、それら各スチールボール70は、貫通孔68の延出方向の長さ寸法よりも所定寸法大きな径をもって構成されており、それによって、貫通孔68における軸部34の外周面側開口部から何等突出せしめられていない状態では、一部分が、軸部側開口部40内に突出せしめられる一方(図1参照)、貫通孔68における軸部34の内周面側開口部から何等突出せしめられていない状態では、一部分が、

軸部34から側方に突出せしめられるようになっている(図2参照)。なお、図1中、72、72は、各スチールボール70、70のそれぞれの貫通孔68、68内からの離脱を阻止するためのゴムリングである。

【0054】一方、小ピストン18の軸部74の上端部には、径方向に所定高さ突出し、且つ周方向に連続して延びる突出部88が形成されている。この突出部88は、その外周面が、大ピストン16の挿通孔38における軸部側開口部40の内径よりも僅かに小さな外径を有する保持面89とされていると共に、その下面が、上方に向かうに従って次第に大径となるテーパ面形状を呈する押圧面90とされている。

【0055】而して、ここでは、そのような小ピストン18が上方の移動端に位置せしめられた状態では、該突出部88の押圧面90が、大ピストン16の軸部34に設けられた各貫通孔68と同一の高さに位置せしめられて、大ピストン16の軸部34の各貫通孔68内に配置された各スチールボール70の軸部側開口部40内への突出部位に接触せしめられるようになっている(図1及び図4参照)。そして、この小ピストン18の下方への移動により、各スチールボール70が、前述の如きテーパ面形状とされた押圧面90にて水平方向に押圧されて、各貫通孔68内を外方に向かって移動せしめられ、また、小ピストン18が下方の移動端に到達することによって、各スチールボール70が、貫通孔68における軸部34の外周面側開口部を通じて、軸部34から側方に、部分的に突出せしめられると共に、突出部88の保持面89にて、そのような突出状態が保持されるようになってい

【0056】一方、第二の締結体12は、第一の締結体10における大ピストン16の軸部34が挿通可能な大きさの内孔を有する、全体として、略円筒形状を呈している。そして、かかる円筒状の第二の締結体12にあっては、その内周面における軸方向中間部位に、径方向内方に向かって所定高さ突出し、且つ周方向に連続して延びる係合突部92が一体的に設けられており、それによって、内周面における下部部位に、周方向に連続して延びる凹部93が、形成されている。

【0057】また、この第二の締結体12に設けられた係合突部92は、大ピストン16の軸部34の外径よりも僅かに大きな内径をもって成っており、その上面が、下方に向かうに従って次第に小径となるテーパ面形状を有する係合面94とされている一方、その下面が、水平面からなる接触面96とされている。一方、該係合突部92の下部に設けられた凹部93は、第二の締結体12が第一の締結体10にいんろう嵌合せしめられる際において、該第一の締結体10における前記円筒状突起30の嵌入部位として形成されており、その内周面が、締結されるべき前記治具プレート11と前記ベースエレメント13との対向方向たる上下方向(鉛直方向)に向かっ

て延びる、第二の締結体側嵌合面 95 とされている。なお、ここでは、特に、第一及び第二の締結体 10、12 のいんろう嵌合状態で、かかる第二の締結体側嵌合面 95 と、前記円筒状突起 30 の外周面にて与えられる第一の締結体側嵌合面 31 との間のクリアランスが「遊び」のない大きさとされるように、換言すれば、第一及び第二の締結体側嵌合面 31、95 同士が互いに密接せしめられる如き状態となるように、第二の締結体側嵌合面 95 の内径が、第一の締結体側嵌合面 31 の外径と略同じ寸法か、若しくは極く僅かに大きな寸法とされている。

【0058】そして、このような第二の締結体 12 が、下部外周面に一体形成された外フランジ部に配設された複数の取付ボルトにより、治具プレート 11 の下面に対して位置固定に取り付けられているのである。

【0059】ところで、かくの如き構成を有する第二の締結体 12 と前述の如き構造とされた第一の締結体 10 とを有する本実施形態の締結装置が用いられる場合には、治具プレート 11 とベースエレメント 13 との締結とその解除とが、例えば、以下のようにして行われることとなる。

【0060】すなわち、先ず、図 1 に示されるように、治具プレート 11 とベースエレメント 13 とを、それぞれにそれぞれ固定された第二の締結体 12 と第一の締結体 10 とが互いに離間し、且つ同軸的に位置するように、上下方向に対向配置させる。そして、そのような配置状態で、ベースエレメント 13 に固定された第一の締結体 10 の大油圧室 36 内と小油圧室 78 内とに、前述せる如くして圧油を充填せしめることにより、大ピストン 16 と小ピストン 18 とを、それぞれ、皿ばね 64 と圧縮コイルばね 86 の付勢力に抗して上方への移動端に位置せしめると共に、大ピストン 16 の各貫通孔 68 内のスチールボール 70 を、該大ピストン 16 に設けられた挿通孔 38 の軸部側開口部 40 内に突出せしめ、且つその突出部位において、小ピストン 18 の軸部 74 における押圧面 90 に接触させて位置せしめる。なお、このとき、各スチールボール 70 が、第一の締結体 10 から、その側方に何等突出せしめられていないようにしておく必要がある。また、大ピストン 16 の軸部 34 に外挿固定されたスリーブ 57 は、その上部部位が、シリンダ部材 14 におけるヘッド部 22 の中心孔 28 内から上方に突出位置せしめられることとなる。

【0061】次いで、図 2 に示される如く、第二の締結体 12 と第一の締結体 10 とを上下方向において互いに接近移動せしめて、第一の締結体 10 のシリンダ部材 14 から突出せしめられた大ピストン 16 の軸部 34 の突出部位に第二の締結体 12 を外挿しつつ、該第二の締結体 12 の前記凹部 93 における第二の締結体側嵌合面 95 と、第一の締結体 10 における円筒状突起 30 の第一の締結体側嵌合面 31 とにおいて、第一の締結体 10 と

第二の締結体 12 とをいんろう嵌合せしめる。このことから明らかなように、ここでは、大ピストン 16 の軸部 34 にて、第一の移動部材の延出部が構成されているのである。

【0062】なお、このときの第一の締結体 10 と第二の締結体 12 の嵌合位置は、第二の締結体 12 における係合突部 92 の接触面 96 が、第一の締結体 10 における大ピストン 16 の軸部 34 に外挿されたスリーブ 57 の当接面 61 に当接せしめられる位置とする。また、このような嵌合状態下では、第一の締結体側嵌合面 31 と第二の締結体側嵌合面 95 とが互いに密接せしめられる如き状態とされており、以て第一の締結体 10 と第二の締結体 12 との、互いの対向方向に対する直角な全ての方向への相対移動を効果的に阻止せしめ得るのである。

【0063】その後、かかる第一の締結体 10 と第二の締結体 12 との嵌合状態下で、第一の締結体 10 における流油孔 24 の閉塞状態を解除することにより、小ピストン 18 を圧縮コイルばね 86 の付勢力により下方に移動せしめて、小油圧室 78 内の圧油を、流油路 58 と流油孔 24 とを通じて外部に排出する。また、それと共に、この小ピストン 18 の下方への移動に伴って、前述の如く、前記挿通孔 38 の軸部側開口部 40 内に突出せしめられた各スチールボール 70 を、小ピストン 18 の突出部 88 の押圧面 90 により押圧して、各貫通孔 68 内を移動させ、それら各スチールボール 70 のそれぞれの一部部位を、貫通孔 68 における軸部 34 の外周面側開口部を通じて、大ピストン 16 の軸部 34、つまり、第一の締結体 10 から側方に突出せしめる。そして、小ピストン 18 を更に下方へ移動させて、下方の移動端に到達せしめることにより、各スチールボール 70 の突出部位を、第二の締結体 12 における係合突部 92 の係合面 94 に係合せしめる。なお、このとき、各スチールボール 70 が、その突出側とは反対側部位において、小ピストン 18 の突出部 88 の保持面 89 に当接せしめられ、それによって、各スチールボール 70 の第一の締結体 10 からの突出状態が保持せしめられることとなる。

【0064】次いで、図 3 に示されるように、上述の如くして小ピストン 18 を下方の移動端に到達せしめることにより、狭窄開口部 50 のボール弁 52 による閉塞を解除して、大ピストン 16 を二つの皿ばね 64、64 の付勢力により下方に移動せしめると共に、大油圧室 36 内の圧油を、閉塞金具 46 の貫通孔 48 を通じて小油圧室 78 内に向かって流動せしめ、更に、流油路 58 と流油孔 24 を通じて外部に排出する。そして、このような大ピストン 16 の下方への移動に伴って、大ピストン 16 の各貫通孔 68 の上側内周面により、各スチールボール 70 を下方に押圧して、それら各スチールボール 70 に係合せしめられた第二の締結体 12 における係合突部 92 の係合面 94 を押し下げ、それによって、該第二の締結体 12 を、該係合突部 92 の接触面 96 が前記シリ

ンダ部材 14 における円筒状突起 30 の上端面に接触せしめられる位置まで、下方に更に移動させる。

【0065】なお、このとき、大ピストン 16 の軸部 34 に外挿固定されたスリーブ 57 が、該軸部 34 の外周面とシリンダ部材 14 におけるヘッド部 22 の中心孔 28 の内周面との間に形成された前記隙間 56 内に引込み移動せしめられ、該大ピストン 16 の下方の移動端への到達によって、スリーブ 57 の当接面 61 が、ヘッド部 22 の前記円筒状突起 30 の上端面と略面一に位置せしめられることとなる。また、このような大ピストン 16

の移動下では、各スチールボール 70 が、係合突部 92 のテーパ面形状とされた係合面 94 に対する押圧力の反力に基づいて、前記挿通孔 38 の軸部側開口部 40 内に向かって作用する作用力を受けるが、前記保持面 89 との当接によって、挿通孔 38 内への移動が阻止されるようになっている。

【0066】そして、このようにして、第二の締結体 12 における係合突部 92 の接触面 96 をシリンダ部材 14 の円筒状突起 30 の上端面に接触せしめた状態で、該係合突部 92 の係合面 96 を各スチールボール 70 に

て下方に押圧することにより、かかる係合突部 94 を、各スチールボール 70 とシリンダ部材 14 の円筒状突起 30 との間でクランプして、第一及び第二の締結体 10、12 のクランプを行い、以て、第一の締結体 10 が固定されたベースエレメント 13 と、第二の締結体 12 が固定された治具プレート 11 とを、それらの対向方向たる上下方向において移動不能な状態で、相互に締結せしめるのである。

【0067】また、そのような治具プレート 11 とベースエレメント 13 との締結状態を解除するには、先ず、

図 4 に示される如く、油圧ポンプ等から供給される圧油を、流油孔 24 と流油路 58 とを通じて小油圧室 78 内に導入し、該小油圧室 78 内に作用せしめられる油圧により、小ピストン 18 を圧縮コイルばね 86 の付勢力に抗して上方に移動せしめる。それによって、小ピストン 18 の突出部 88 の保持面 89 と各スチールボール 70 との当接を解消せしめて、上述の如く、それら各スチールボール 70 に対して作用せしめられる前記作用力により、各スチールボール 70 を、各貫通孔 68 内において、挿通孔 38 の軸部側開口部 40 内に向かって引込み

塞金具 46 の貫通孔 48 のボール弁 52 による閉塞を解除して、前記大油圧室 36 内に圧油を導入し、この大油圧室 36 内に作用せしめられる油圧により、大ピストン 16 を皿ばね 64 の付勢力に抗して上方に移動せしめる。これにより、該大ピストン 16 の軸部 34 におけるシリンダ部材 14 の中心孔 28 からの突出部位に外挿固定されたスリーブ 57 の当接面 61 にて、それに当接する第二の締結体 12 の係合突部 92 の接触面 96 を押し上げるようにして、第二の締結体 12 を上方に突き出し、以て第一の締結体 10 と第二の締結体 12 の前記第一及び第二の締結体側嵌合面 31、95 における嵌合状態の縁切りを行うのである。

【0069】そして、その後、第二の締結体 12 と第一の締結体 10 とを上下方向に相対移動せしめることによって、治具プレート 11 とベースエレメント 13 との締結を解消するのである。

【0070】このように、本実施形態においては、第一の締結体 10 と第二の締結体 12 とを、第一及び第二の締結体側嵌合面 31、95 において、いろう嵌合せしめた状態で、単に、小油圧室 78 内と大油圧室 36 内の圧油を排出するだけで、それら第一及び第二の締結体 10、12 のクランプが行われて、治具プレート 11 とベースエレメント 13 とが容易に且つ確実に締結され得るのである。

【0071】そして、かかる本実施形態にあっては、そのような第一及び第二の締結体 10、12 の嵌合状態で、第一の締結体側嵌合面 31 と第二の締結体側嵌合面 95 と互いに密接せしめられる如き状態とされて、第一の締結体 10 と第二の締結体 12 とが、互いの対向方向に対して直角な全ての方向への相対移動が阻止され得るようになっているところから、それら第一及び第二の締結体 10、12 が、かかる方向に位置ずれを起こすようなことが、確実に防止され得ることとなる。

【0072】しかも、本実施形態にあっては、第一及び第二の締結体 10、12 の嵌合状態下において、小油圧室 78 内と大油圧室 36 内に圧油を供給することによって、第一及び第二の締結体 10、12 のクランプが解消せしめられると共に、第一の締結体 10 における大ピストン 16 に固定されたスリーブ 57 にて、第二の締結体 12 が上方に突き出されて、それら第一及び第二の締結体 10、12 の嵌合状態の縁切りも、確実に行われ得るようになっているところから、上述の如く、第一の締結体側嵌合面 31 と第二の締結体側嵌合面 95 と互いに密接せしめられる如き状態とされているにも拘わらず、第一及び第二の締結体 10、12 のクランプの解消と同時に、それらの嵌合状態も、確実に且つ極めて容易に解除され得るのである。

【0073】従って、このような本実施形態に係る締結装置を用いれば、治具プレート 11 とベースエレメント 13 の締結及びその解除のスムーズな操作性を有効に確

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保しつつ、それら治具プレート11とベースエレメント13の締結位置の精度が有利に高められ得て、常に安定した位置精度が、極めて効果的に確保され得ることとなるのである。

【0074】また、本実施形態においては、第二の締結体12と第一の締結体10とを上下方向において互いに接近移動せしめて、第一の締結体10のシリンダ部材14から突出せしめられた大ピストン16の軸部34の突出部位に第二の締結体12を外挿しつつ、それら第一及び第二の締結体10、12が、第一及び第二の締結体側10 嵌合面31、95において、互いにいんろう嵌合せしめられるようになっているところから、単に、大ピストン16の軸部34に対して第二の締結体12の外挿せしめるだけで、第一及び第二の締結体側嵌合面31、95が互いに対応するように容易に位置決めされ得、以て、それら第一及び第二の締結体10、12の嵌合操作が、より確実に且つスムーズに行われ得るのである。

【0075】さらに、本実施形態にあっては、大ピストン16の上方への移動により、第二の締結体12を突き上げて、第一及び第二の締結体10、12の嵌合状態の縁切りを行うスリーブ57が、大ピストン16の軸部34に固定された支持円板59にて下方への移動が阻止された状態で、該軸部34に外挿されて、取り付けられているところから、例えば、かかるスリーブ57を高さの異なるものに種々取り替えるだけで、第二の締結体12が突き出された際の高さ位置等を容易に変更することが出来るのである。

【0076】更にまた、本実施形態にあっては、第二の締結体12において、各スチールボール70が係合せしめられる係合突部92が、前記スリーブ57にて突き上げられるようになっているところから、第二の締結体12には、スリーブ57にて突き上げられる部位が特別に設けられておらず、その分だけ、第二の締結体12、ひいては装置全体の構造が、有利に簡略化され得ているのである。

【0077】また、本実施形態においては、小油圧室78内と大油圧室36内に作用せしめられる油圧による上方への移動によって、治具プレート11とベースエレメント13との締結状態を解除せしめる小ピストン18と大ピストン16のうち、小ピストン18が、大きな移動ストロークと小さな面積の圧力受容面とを有して構成される一方、大ピストン16が、小さな移動ストロークと大きな面積の圧力受容面とをもって成っているところから、治具プレート11とベースエレメント13との締結状態が解除せしめるために、小油圧室78内と大油圧室36内とに導入される圧油の合計量が、移動ストロークと圧力受容面の面積とが何れも大きく設定された一つのピストンを有してなる従来の締結装置において、締結された二つの部材の締結状態を解除せしめるのに必要される圧油の量よりも、極めて効果的に少なく抑えることが

出来るのである。

【0078】それ故、かかる本実施形態の締結装置にあっては、例えば、大面積の治具プレート11とベースエレメント13とを締結する場合等において、複数個が用いられても、圧油を大量に吐出可能な大型の油圧ポンプ等を何等使用する必要がなく、それによって、それら大面積の治具プレート11とベースエレメント13とを締結せしめる際等における作業性を有利に高めることが出来、また、その作業コストを有利に低減させることが可能となるのである。

【0079】さらに、本実施形態においては、小ピストン18が、大ピストン16の軸部34に形成された挿通孔38内に、軸方向において上下に移動可能に、且つ同軸的に配置されていることから、小ピストン18が、第一の締結体10内に、場所を取らずに配設され得、それによって、第一の締結体10、ひいては締結装置全体が有利に小型、コンパクト化され得ているのである。

【0080】更にまた、本実施形態にあっては、第一の締結体10から側方に向かって突出引込み移動せしめられる複数のスチールボール70が、小ピストン18の軸部74に形成される複数の貫通孔68内に配置されているところから、複数のスチールボール70の配置スペースを、小ピストン18と大ピストン16の配設スペースとは別に設ける必要がなく、それによって、第一の締結体10及び締結装置全体の小型、コンパクト化が、より有効に図られ得ることとなる。

【0081】以上、本発明の具体的な構成について詳述してきたが、これはあくまでも例示に過ぎないのであって、本発明は、上記の記載によって、何等の制約をも受けるものではない。

【0082】例えば、前記実施形態では、第二の移動部材が、複数のスチールボール70にて構成されていたが、かかる第二の移動部材は、締結されるべき二つの部材の対向方向に対して直角な方向に移動せしめられて、第一の締結体から突出／引込み移動せしめられるように構成されるものであれば、その構造は、何等限定されるものではなく、従って、第二の移動部材を適当なコロ部材や板材、或いはブロック体等にて構成しても、何等差し支えないのである。

【0083】また、そのような第二の移動部材の配設個数も、必ずしも複数とされている必要はなく、第二の締結体を第一の締結体との間で確実にクランプし得るのであれば、一つだけ配設するようにしても良い。

【0084】さらに、前記実施形態では、第二の移動部材たる複数のスチールボール70が、第一の移動部材を構成する大ピストン16に設けられた貫通孔68内に配設されて、かかる貫通孔68内から突出／引込み移動せしめられるようになっていたが、第二の移動部材の配設位置や移動構造も、特にこれに限定されるものでないことは言うまでもないところである。

【0085】また、前記実施形態では、第一の移動部材が、第二の移動部材たる複数のスチールボール70の第二の締結体12に対する係合操作を行う小ピストン18と、第一及び第二の締結体10、12のクランプ操作を行わしめる大ピストン16とにて構成されていたが、かかる第一の移動部材を、それら二つの操作の両方を行う一つの部材にて構成しても、何等差し支えない。

【0086】さらに、第一の移動部材を、小ピストン18と大ピストン16とにて構成する場合にあっても、それら小及び大ピストン18、16の上下方向（締結されるべき二つの部材の対向方向）への移動構造が、前記実施形態に示されるものに、特に限定されるものではなく、例えば、小及び大ピストン18、16をそれぞれ上方に移動させる油圧を作用せしめる二つの油圧室に加えて、それらをそれぞれ下方に移動させる油圧を作用せしめる二つの油圧室を更に設けて、それらの油圧にて、小及び大ピストン18、16を、それぞれ上下方向に移動させるようにすることも、可能である。

【0087】更にまた、前記実施形態では、第一の移動部材を構成する大ピストン16の軸部34に外挿されたスリーブ57にて、突出し部が構成されていたが、かかる突出し部は、締結されるべき二つの部材の対向方向において第二の締結体に対向する当接面を有し、且つ第一の移動部材の該対向方向における移動により、該当接面を第二の締結体に当接させて、該第二の締結体を該対向方向に突き出し得るように構成されるものであれば、第一の移動部材に対する配設構造が、何等限定されるものではなく、従って、例えば、前記大ピストン16に、第二の締結体との対向方向に対して直角な方向に向かって所定高さ突出し、該第二の締結体との対向面が当接面とされた凸部を一体的に形成し、この凸部を突出し部として、構成しても良いのである。

【0088】また、前記実施形態では、突出し部としてのスリーブ57の当接面61が、第二の締結体12の係合突部92の接触面96に当接せしめられ、第二の締結体12が、かかる係合突部92において突き出されるようになっていたが、突出し部の当接面が、第二の締結体12に対して、係合突部92の接触面96とは異なる部位に当接せしめられ、該第二の締結体12が、かかる当接部位において、突出し部にて突き出されるように構成しても、何等差し支えないのである。

【0089】さらに、小ピストン18と大ピストン16の配設構造も前記実施形態に示されるものに、決して限定されるものではなく、それらが、締結されるべき二つの部材たる治具プレート11とベースエレメント13の対向方向に移動せしめられる得るようになっておれば、小ピストン18と大ピストン16とを、縦に並べて、或いは横に並べた状態で、配設しても良いのである。

【0090】更にまた、前記実施形態では、第二の締結体12が、第一の締結体10に対して外挿せしめられ

て、上下方向において嵌合せしめられるようになっていたが、第一の締結体に、所定の嵌合孔を設け、この嵌合孔内に第二の締結体を挿通することにより、第一の締結体と第二の締結体とを嵌合するように為すことも可能であり、また、それら第一の締結体と第二の締結体の嵌合方向は、締結されるべき二つの部材の対向方向に応じて変更されるものである。なお、第一の締結体の嵌合孔内に第二の締結体を挿通して嵌合する嵌合構造を採用する場合には、第二の移動部材が、嵌合孔内に向かって、第一の締結体の内方に移動せしめられるように構成されることとなる。

【0091】加えて、前記実施形態では、本発明を、マシニングセンタ等の工作機械のテーブルに取り付けられるベースエレメントと治具プレートとを相互に締結するために用いられる締結装置に対して適用したものの具体例を示したが、本発明が、ベースエレメントと治具プレート以外の互いに締結されるべき二つの様々な部材を相互に締結するために用いられる締結装置に対しても、有利に適用され得るものであることは、勿論である。

【0092】その他、一々列挙はしないが、本発明は、当業者の知識に基づいて種々なる変更、修正、改良等を加えた態様において実施され得るものであり、また、そのような実施態様が、本発明の趣旨を逸脱しない限り、何れも、本発明の範囲内に含まれるものであることは、言うまでもないところである。

【0093】

【発明の効果】以上の説明からも明らかなように、本発明に従う締結装置によれば、締結されるべき二つの部材の締結及びその解除のスムーズな操作性を有効に確保しつつ、それら二つの部材の締結位置の精度がより一層有利に高められ得て、常に安定した位置精度が、極めて効果的に確保され得ることとなるのである。

【図面の簡単な説明】

【図1】本発明に従う締結装置の一例を示す縦断面説明図である。

【図2】図1に示された締結装置の使用状態を示す説明図であって、第一の締結体に第二の締結体を嵌合せしめた状態で、第一の締結体から突出せしめた複数のスチールボールを第二の締結体の係合突部に係合せしめた状態を示している。

【図3】図1に示された締結装置の別の使用状態を示す説明図であって、複数のスチールボールの第一の締結体からの突出部位と第一の締結体のシリンダ部材との間で、第二の締結体の係合突部をクランプして、第一及び第二の締結体がそれぞれ固定されたベースエレメントと治具プレートとを相互に締結せしめた状態を示している。

【図4】図1に示された締結装置の更に別の使用状態を示す説明図であって、ベースエレメントと治具プレートとの締結状態から、複数のスチールボールの係合突部に

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対する係合を解除した状態を示している。

【図 5】図 1 に示された締結装置の他の使用状態を示す説明図であって、複数のスチールボールの係合突部に対する係合を解除した状態下において、第一の締結体における大ピストンの上方への移動により、第二の締結体を、該大ピストンに外挿固定されたスリーブにて上方に突き出して、第一の締結体と第二の締結体の嵌合状態を縁切りした状態を示している。

【符号の説明】

10 第一の締結体
ト

11 治具プレー 10
＊

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＊ 12 第一の締結体
メント

14 シリンダ部材

18 小ピストン

31, 95 嵌合面

57 スリーブ

64 皿ばね

70 スチールボール

86 圧縮コイルばね

92 係合突部

94 係合面

13 ベースエレ
メント

16 大ピストン

30 円筒状突起

36 大油圧室

61 当接面

68 貫通孔

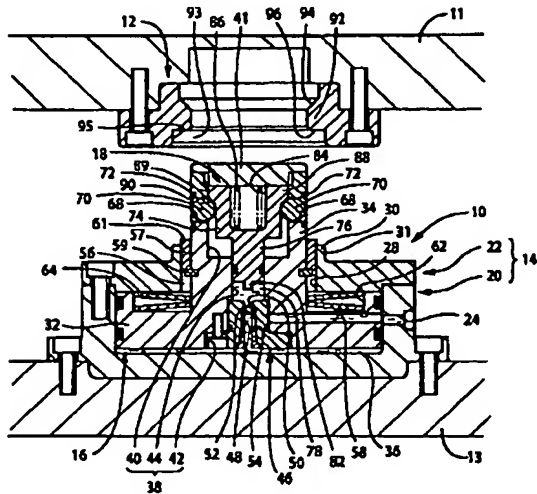
78 小油圧室

90 押圧面

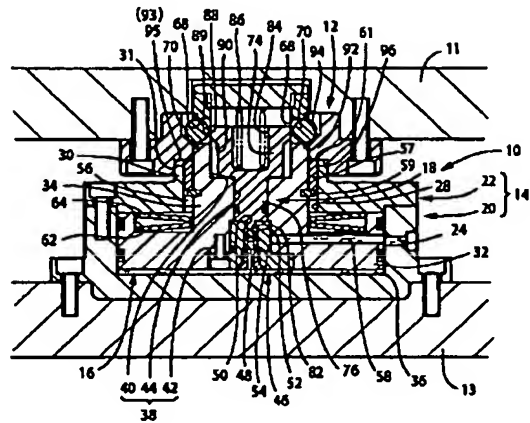
93 凹部

96 接触面

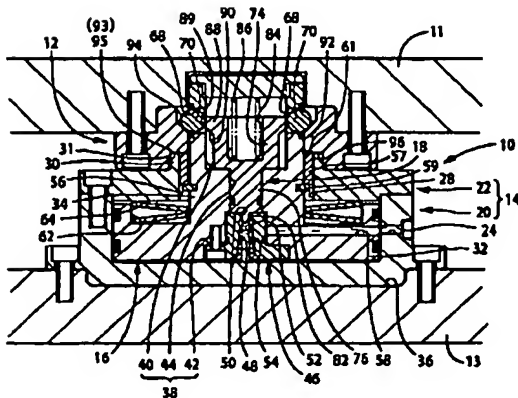
【図 1】



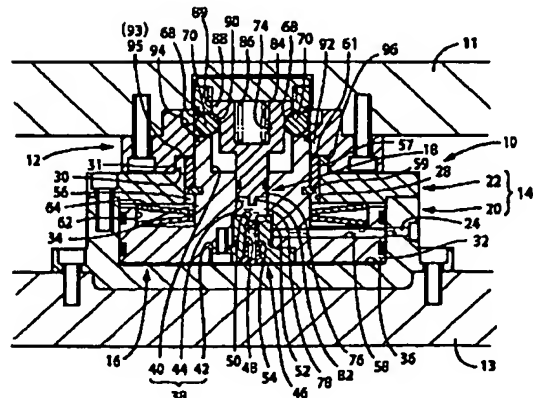
【図 2】



【図 3】



【図 4】



【図5】

